THE MODEL ENGINEER

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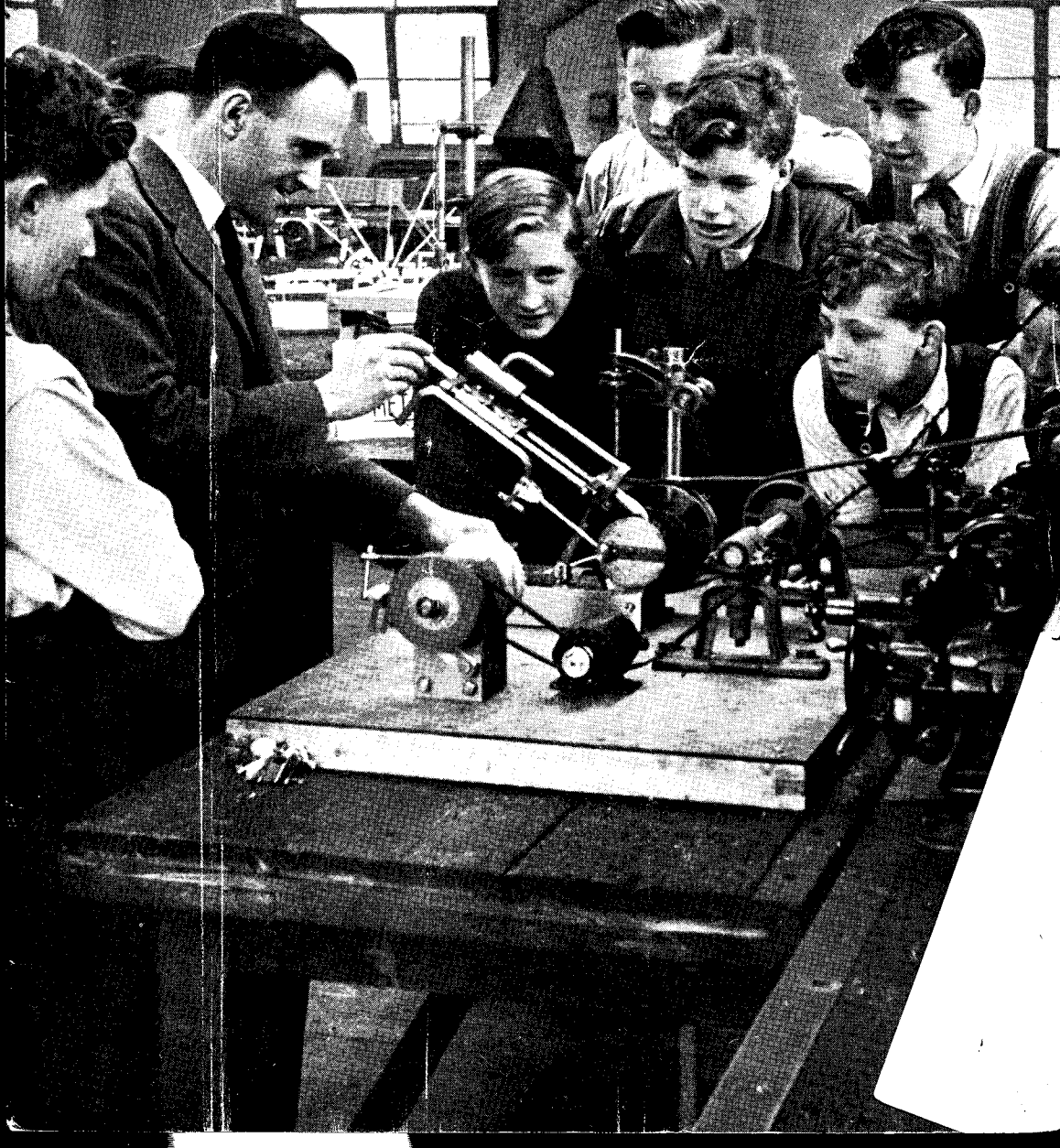


The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

27TH JULY 1950 VOL. 103 NO. 2566

SMOKE RINGS

Our Cover Picture

● WE HAVE on several occasions referred to the increasing interest which is being taken in model engineering as an aid to technical training. In the past, metalwork and other basic handicraft have sometimes been neglected or been regarded as a very minor part of the general school curriculum, but it is now generally realised that training scholars to use their hands is an important factor in getting them to use their brains; and moreover, the construction of mechanical models is by far the easiest and most interesting way of introducing them to mechanical and scientific principles. This photograph, submitted to us by Mr. H. Preston, metalwork master at Newton-le-Willows Technical School, Lancs, depicts a demonstration of machine tools which have been constructed in the school workshop, in which more than one item which has been described in THE MODEL ENGINEER can be recognised. From the keen interest taken in these machines by the boys, it is quite clear that this work is regarded as something more than a routine lesson. One of the most important functions of education is to make the rising generation into good and useful citizens; and what better citizen can there be than he who learns to be a creative craftsman, and whose greatest satisfaction in life is "something attempted—something done"?

"M.E." Exhibition Posters

● POSTERS ADVERTISING the 1950 "M.E." Exhibition are now available for any readers who are willing to display them. Also, tickets in advance can be obtained at 2s. 3d. each for adults, 1s. each for children under 14 years of age, and party tickets are available for parties of 20 or more, at 1s. 9d. each for adults and 6d. each for children. These party tickets will enable people to enter the exhibition without queueing. Applications for tickets and posters should be made to: The Exhibition Manager, Percival Marshall & Co. Ltd., 23, Great Queen Street, London, W.C.2.

Locomotive Driving Tests

● THE M.M.E.T. AFFILIATION has arranged three dates on which prospective drivers of miniature locomotives will be able to display their prowess with a view to obtaining official certificates of proficiency.

On Saturdays, July 29th and August 5th, the tests will be conducted on the Chingford and District Model Engineering Club's track in Ridgeway Park, Chingford, London, E.4. The site is accessible by the No. 38 bus from Victoria, which passes the park. Visitors using their own cars should take the North Circular Road to "The Crooked Billet," Walthamstowe, turn left

into Chingford Mount Road, proceed over Chingford Mount, and the park entrance is about 100 yards past " The Green Man " on the left. On Sunday, September 3rd, tests will be carried out at the Watford Model Engineering Society's track at Chipperfield.

Model Motor Racing in Grimsby

● IN OUR issue dated June 29th we published in these columns, under the above heading, an announcement that the Grimsby and District Society of Model and Experimental Engineers were at work preparing their 70 ft. diameter track, for their opening event on August 27th. A short account was given of the work involved, and enthusiasts were asked to contact the club secretary, should they feel inclined to lend a hand.

A letter has come in from the hon. secretary, Mr. J. Tarttelin, who informs us that the subject matter was not accurate. In actual fact, the track is being constructed entirely by the Cleethorpes Council, without any assistance from the society so, contrary to our announcement, no help is needed in this direction.

Mr. Tarttelin goes on to say, however, that the club's railway track, which is now nearing completion, has been constructed entirely by the members and help is always welcome on this site.

A Lone Hand in Sudan

● REFERRING TO a " Smoke Ring " published in our April 13th issue, Mr. R. R. May, a reader in the Sudan has sent us the following letter which we think is of sufficient general interest to print in full :—

" Your editorial in the issue of April 13th has prompted me to write to you as a ' lone hand ' from the heart of Africa. I have been a reader of THE MODEL ENGINEER on and off since I was a schoolboy, some 25 years ago, but it is only since the war that I have become a regular subscriber, which happy condition I hope that I shall be able to maintain until I die. Of all my mail, the little ' M.E.' is by far the most eagerly looked forward to. I read, I suppose, every word in it from cover to cover and lose myself for a happy two or three hours in the delightful atmosphere of its pages ; the delightful engineering atmosphere where Cost, Time, Bare Efficiency, Speed and the ' Only just good enough job ' take a back seat for a change. This may be a new angle from which to view your readers, but as a professional engineer daily confronted with the soulless demands of the accountant, and the ' What does it matter so long as it works," attitude of so many people to whom any machine, even an engine, is purely a means to an end and nothing else ; your little journal is a real refuge. My only complaint is that it's not nearly big enough.

" I cannot really call myself a ' model engineer,' as I have never made a model in the true sense of the word, a situation which I hope to rectify before long, but I have a small workshop with a goodly selection of hand tools, a lathe, drilling machine, etc., where I pass my spare time in a little world of my own where every job is done the way I would like to see it done—a world where perfection is the aim and effectiveness (the algebraic sum of all the efficiencies) is the criterion.

" I have a great deal I would like to write about, but on this occasion I will confine myself to three points : first, my thanks to your contributors, especially the regular ones, ' L.B.S.C.', E. T. Westbury, ' Duplex,' Ned—to mention only a few. I should love to meet them in the flesh, and see how the pictures which I have conjured up of their personalities compare with real life. Incidentally, what about a few brief pen pictures in THE MODEL ENGINEER of some of your leading contributors ?

" Secondly, I do hope that THE MODEL ENGINEER will never lose its present character, which is unique. An editorial some time back in which you were discussing ' Policy ' rather perturbed me inasmuch as I sensed a tendency to invite contributions on matters having purely domestic applications. These activities, excellent in themselves, are well catered for in other publications, and for THE MODEL ENGINEER to steer this course, must inevitably result in it becoming a mere handyman's magazine.

" Thirdly, as one who has been brought up on i.c. engines (although a lover of steam engines) I am surprised and even disappointed, that no one, as far as I know, has ever made a working model of the larger type of multi-cylinder marine or stationary oil engine. With the exception of one or two single cylinder horizontal petrol engines, there is a monotonous succession of small high-speed power units, few of which can be classed as models. I realise that there are considerable difficulties to be overcome in making a working model oil engine, but has anyone tried to overcome them yet ? I have one or two ideas on the subject, but I must admit, that they haven't as yet got much farther than that. What about it Mr. Westbury ? Remember, there is always the example of the small steam locomotive before us."

An Unfortunate Error

● OUR ATTENTION has been drawn to an extraordinary printer's error which occurred in the " Sales and Wants " columns of our issue of July 13th. The advertisement concerned is the one announcing the sale of the well-known business of Corbett's (Lathes), Stanton Hill. But first, we would say that we are sure that many of our readers will share our regret that Mr. Corbett has found it necessary to retire from a business which has made his name something of a household word to our readers for so long, and we take this opportunity of wishing him many years of happiness and freedom from anxieties in his well-earned retirement.

It is particularly unfortunate, however, that on this occasion the advertisement contained a misprint. By the insertion of a " t " instead of an " r," the message to customers referred to " business as usual with out prompt attention to your requirements." The error is obvious, however, since, in common usage, the word " without " is never rendered as two words ; it was a clear case of the frailty of human nature. We tender our apologies to Mr. Corbett for any inconvenience he may have suffered.

WHAT TO SEE

AT THE 1950 "MODEL ENGINEER" EXHIBITION

Interesting Trade Exhibits

In presenting our list of trade firms who will be exhibiting in this year's Exhibition, we are pleased to be able to draw readers' attentions to a number of new names and appliances which, combined, will lend added interest to this already popular section.

Each year in the past we have noted with satisfaction the praiseworthy strides taken by those members of the trade who cater specially for the wants of the model engineer, and we are full of confidence that this year our visitors will be able to witness even greater progress than ever before.

At all these stands you will find attendants eager to fulfil your every need. Do not hesitate to ask their advice on any subject in which they specialise; your pleasure is their business and you will find them only too happy to oblige.

In the space at our disposal, we cannot do justice to each and every exhibitor, but we append, in alphabetical order, a brief summary of each stand so far as information is to hand at the time of compiling this article.

Patrick Adie, Ltd., Wokingham, Berks. The special attraction of this stand is the "Adieclock" outfit for the construction of a synchronous electric clock to work on a.c. mains. It incorporates finished parts for the motor unit, including the wound field coil, also frame and motion plates, gearing, dialwork and bezel, ready for assembly with simple hand tools. Other features of the display include the "Metalectric" clock, supplied only as a finished unit, and the "Adiecope" miniature slide and filmstrip projectors, which have established a high reputation for educational and entertainment purposes, and are shown here in their latest improved form.

Ian Allan Ltd., 282, Vauxhall Bridge Road, London, S.W.1., publishers of very popular railway and other literature, photographs, etc., specially for boys of all ages from 9 to 90, will be showing selections of their publications, many of which are of interest as well as use to railway enthusiasts, whatever their particular tastes may be.

Bassett-Lowke Ltd., St. Andrews Street, Northampton, for more than fifty years, have catered for a very wide range of model engineering and shipping interests. This firm's products are known all over the world and scarcely call for any detailed reference in these notes. Small-scale model railways, steam locomotives in all sizes up to 15-in. gauge, ship models, yachts, scenic models of all kinds and special commercial models are among the specialities, and the stand will display a selection drawn from this very wide range.

Buck & Ryan, Ltd., 310, 312, Euston Road, London, N.W.1. This stand is notable, not only as one of the most hardy annuals in the exhibition, but also as a centre of attraction to all who are interested in tools of high quality. Every kind of tool for the modern craftsman will be found here including hand tools for wood and metal by leading British and foreign manufacturers, also lathes and other machine tools of reputed makes, and a wide variety of miscellaneous workshop equipment.

Cartwrights Model Supplies Ltd., 19-21, Elyston Street, London, S.W.3. On this firm's stand there will be a very comprehensive display of constructional kits for model aircraft, railways and ships by well known manufacturers. In addition to modelling materials and accessories of all kinds, C.C.W. Coach Construction kits and Units in "O" and "OO" gauges will be on show.

E. W. Cowell, 7*a*, Sydney Road, Watford, Herts. The Cowell drilling machines will be featured on this stand, including sets of unmachined and part-machined castings for home construction. Instructions for building these machines have recently been given in the articles by "Duplex" in THE MODEL ENGINEER, and therefore call for no further comment, beyond mentioning that they can be confidently recommended to the attention of readers who require a sound and accurate drilling machine for small work.

R. J. Deaves & Co., 57, Tennyson Road, Small Heath, Birmingham. The central feature of this display is an ingenious combination tool for cutting glass, stencils or paper patterns, or for sharpening knives, scissors, shears and other edge tools.

Electronic Developments (Surrey) Ltd., 18, Villiers Road, Kingston-on-Thames. Although newcomers to the exhibition, this firm are well known to modellers for their very successful E.D. compression-ignition engines and the E.D. radio control equipment.

One of the most popular engines in the E.D. range is the popular priced 1 c.c. " Bee," which will be on show with the Mark II 2 c.c., the 2 c.c. Competition Special, Mark III 2.49 c.c., and the Mark IV 3.46 c.c. engines, the prices of which have recently been greatly reduced.

The new E.D. miniature radio control equipment is bound to attract attention because of its low weight (7½ oz. for the receiver, escapement and batteries), and its reasonable price. The equipment will be shown installed in the E.D. " Bee " powered Veron " Sky Skooter," a new kit model which has been designed especially for it, and in a sailing yacht. I.C. engine enthusiasts should not miss seeing the M.I.-E.D. magneto which is now being manufactured by this firm.

The Veron " Sky Skooter." A new kit model designed especially for the latest E.D. miniature radio-control equipment which can be seen on Messrs. Electronic Developments (Surrey) Ltd. Stand

Graham Farish Ltd., Mason's Hill, Bromley, Kent, is a firm whose name has been familiar in domestic circles for many years, but has recently become very prominent in the model railway hobby. The specialities are " OO "-gauge locomotives, coaches, wagons, track and accessories of the cheaper kind, but equipped and manufactured in the most modern fashion to ensure the maximum possible realism of effect at the price. The goods will be attractively displayed on four stands which are certain to arrest the attention of visitors. A working layout on which the firm's products will be fully demonstrated is to be a prominent feature.

Hamblings, 10, Cecil Court, Charing Cross Road, London, W.C.2., have catered for the very popular " OO " gauge for many years during which their products have established a reputation second to none. Moreover, the range has steadily grown until today, when there can scarcely be any need which cannot be filled, so far as " OO "-gauge requirements are concerned. One of the very popular items in Hamblings list is the ready-made locomotive superstructure, equipped with mountings and fittings, all ready for attaching to the frames. This idea has been applied to a large number of different types of locomotives, covering several popular classes on the four pre-nationalisation railway groups. Parts, materials and a most comprehensive range of incidental accessories will be found here, specially produced to meet all the needs of " OO "-gauge enthusiasts.

T. S. Harrison & Sons, Ltd., Heckmondwike, Yorks. This firm, although not perhaps well known by name to our readers, has a well-established reputation as manufacturers of machine tools, including the " Union " range of lathes, drilling machines, grinders and combination tools of various kinds. They have now taken over the production of the Boxford lathes, and these will be featured in their stand display.

Heller & Sons (Engineers) Ltd., Turnpike Lane, Hornsey, London, N.8. This firm will be displaying their range of interlocking stencils, stencil plates, stencil inks and brushes, rubber and metal stamps and accessories, brands, punches and, in fact, all types of marking devices.

Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1. On this firms stand will be seen a large variety of journals and technical books which will be a source of interest, not only to the model engineer, but also to those visitors whose hobbies range from photography to flying, motoring and yachting. Periodicals which will be on sale and display will include *The Autocar, Yachting World, Flight, The Motor Cycle, Wireless World* and *Amateur Photographer.*

E. Keil & Co. Ltd., 195, Hackney Road, London, E.20. The complete range of Keilkraft constructional kits for over fifty types of model aircraft will be displayed on this firm's stand, including four new designs. These are : The " Ace," " Senator " and " Pixie " rubber-driven models and a control-line team racer, the

" Scout." Carl Goldberg's well-known American power duration design, the "Cumulus," which is to be produced as a Keilkraft kit, will also be on show for the first time.

Amongst the very comprehensive range of engines and accessories exhibited the new K.K. " Reeline " handle will interest control-line fliers and radio - control enthusiasts will no doubt be attracted by the latest E.C.C. Tele-Commander equipment for which this firm are the sole distributors.

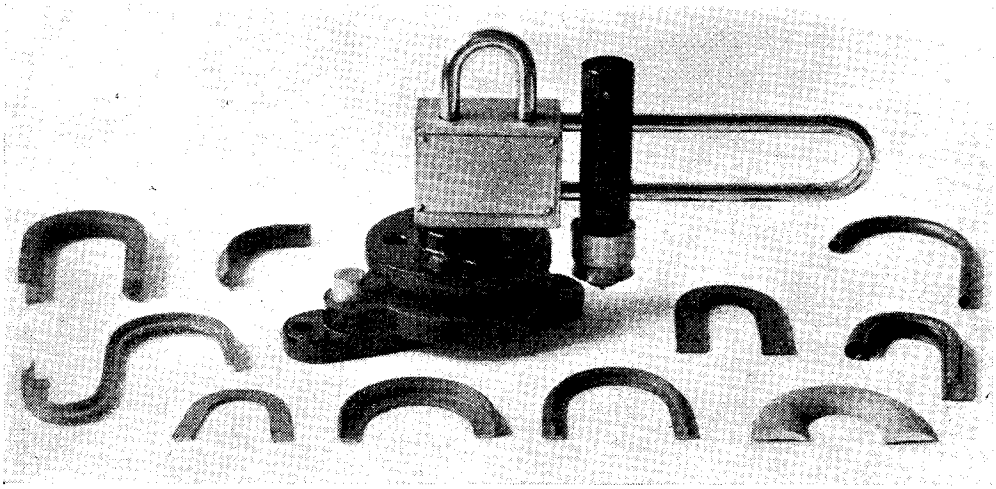
The " Pixie " 23-in. span rubber-driven model which is one of the many new construction kit models being exhibited by Messrs. E. Keil & Co. Ltd.

W. Kennedy Ltd., Station Works, West Drayton, Middlesex. The Kennedy bending machine, which was shown at last year's exhibition and attracted considerable interest, is here seen in its latest improved form. This appliance, which is both inexpensive enough to appeal to the amateur, and compact enough to be accommodated without difficulty in the small workshop, will deal efficiently with all bending operations on rods, tubes, and all metal sections, including edge-on bending of strip material. In addition to the complete machine, sets of parts for its construction are available, the machining of which is simple and straightforward, also within the capacity of the model engineer's equipment.

Kennion Bros. (Hertford) Ltd., 2 and 2*a* Railway Place, Hertford, will have on show castings and parts for miniature steam locomotives, including many by " L.B.S.C." as well as the " Twin Sisters " by J. I. Austen - Walton This firm also produces some excellent nuts, bolts and screws which are highly finished and include a useful range in the special " M.E." threads and dimensions. Taps, dies, files, reamers and a large number of other small tools of the kinds that model engineers need most frequently, can be found among the many interesting items to be seen at this stand.

The Leeds Model Co. Ltd., Potterdale Mills, Dewsbury Road, Leeds 11, are manufacturers of model railway goods in " O " gauge, for export and supply to the trade. This stand will display examples of all their latest products, including the well-known L.M.C. mechanisms, wheels and other most useful accessories for which the firm is famous.

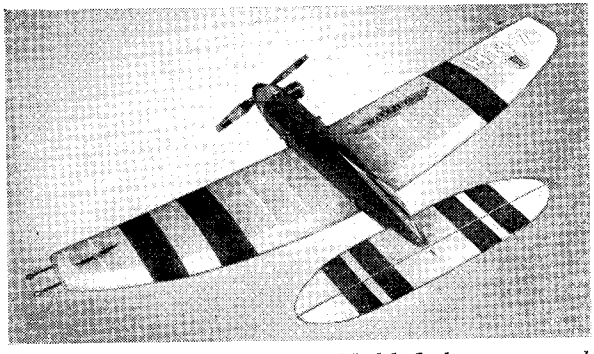
Percival Marshall & Co. Ltd., 23, Great Queen Street, London, W.C.2., the organisers of the exhibition, will have a special stand. Here visitors will see a reproduction of the " M.E." workshop with jobs " in work " and completed, a display of experimental and finished work carried out by such notable personalities as " Duplex," " L.B.S.C." and E. T. Westbury,



The Kennedy bending machine, showing specimens of the work produced

illustrating how the ideas and designs conceived by these craftsmen are first tested and proved *in the workshop* before being described for readers of THE MODEL ENGINEER, its companion journals *The Model Railway News, Model Aircraft, Model Ships and Power Boats* and the well-known range of Percival Marshall technical books and working drawings. Copies of all these famous publications will be displayed on this stand.

Mercury Models Ltd., 308, Holloway Road, London, N.7. The full range of Mercury model aircraft kits will be shown on this firm's stand and an interesting feature will be a display showing the development of a kit from the rough drawing of the model to the finished product. Three new kits which will be on show are the Mercury Mark I Team Racer, Cyril Shaw's "Midge" (holder of the British Class I control-line speed record), and a free-flight flying scale "Monocoupe." The very complete range of the engines and accessories which are distributed by this firm will also be exhibited.



The "Musketeer." A Mercury Models Ltd. stunt control-line model aircraft kit which features a pre-fabricated hollow balsa fuselage

Modelcraft Ltd., 77, Grosvenor Road, London, S.W.1. This stand will exhibit the wide range of plans, kits and accessories for the construction of railways, road transport, ships, galleons, power boats, etc., for which the firm is famous. An interesting addition to the railway series is the set of parts for making model trees. Another addition which will interest ship modelling fans is the series of plans and parts for the construction of a model of the raft *Kon-Tiki*, famous for its voyage from South America to the South Sea Islands.

Multicraft Tools, 29, Bolsover Street, London, W.1. Among the many tools on this stand probably one of the most interesting is the Multicraft precision cutting tool with its four blades, any or all of which can be contained in the handle when not in use. The case is made of aluminium alloy with a knurled collar for tightening the blade-locating collet. The blades are of various shapes and will be found to cover practically any cutting requirement in model-making. The maker of miniature ship models will find it particularly useful as will also the builder of model railways.

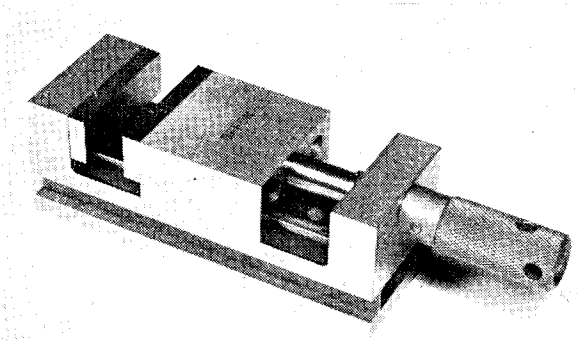
Myford Engineering Co. Ltd., Beeston, Nottingham. Little introduction of the products of this firm is necessary to readers of THE MODEL ENGINEER, among whom the name of Myford has become practically a household word. The stand this year has been enlarged, and will be devoted to practical demonstrations of Myford lathes and their accessories. The ML7 lathe will be shown in use, machining actual components of a type comparable to those encountered in the amateur workshop, and involving milling and other operations which can be carried out with standard attachments. Similar demonstrations will be given on the ML8 woodworking lathe, including the use of attachments for sawing, planing, sanding, etc., and the attendant staff will be available to answer queries and give practical advice on any workshop problems encountered by lathe users.

Henry J. Nicholls, Ltd., 308, Holloway Road, London, N.7. This well-known firm will be exhibiting on their stand a very comprehensive range of model aircraft kits, engines, and accessories of all the popular proprietary brands.

Offen & Co. Ltd., South Nutfield, Redhill, Surrey. The special products of this firm will appeal to all precision engineers whether amateur or professional. They include bench and machine fixtures, measuring devices, and holders for cutting tools for use in the lathe and other machines, all of the most up-to-date design and high quality production.

The Multicraft precision cutting tool

The Offen precision machine vices are made of hardened steel, ground on all faces and suitable for use as jigs or milling fixtures, and similar quality is embodied in the Offen vee-blocks. A useful bench tool is the universal vice, which is equipped with a ball swivel, and can also be fitted with a pedestal mount having provision for raising and lowering.



One of the Offen precision vices

The Offen Micro boring bars, and offset boring heads, are well known, and reputed among toolmakers, and the same applies to the Offen range of internal micrometers, in four sizes, measuring from 0.240 in. to 1.520 in. A useful aid to machining accuracy is the Centre Locator, which works on the old-established "wobbler" principle, enabling work to be readily centred or located from a hole or centre-punch mark.

The Pritchard Patent Product Co. Ltd., Peco Way, Russell Street, Sidmouth, Devon, are specialists in scale permanent way for "OO"-gauge railways, and now cater for "EM"-gauge. The track is reasonably priced, realistic in appearance, and very durable, while it is so designed as to be simple to lay.

Another exclusive product by this firm is a large selection of drawings of prototype locomotives, coaches, wagons, etc., available in 4-mm. and 7-mm. scales. Some of the subjects are rare, and the drawings, small though they are, can easily be used as the bases of models in much larger sizes. The drawings are known as the Roche series.

The Railway Pictorial and Locomotive Review, 156, Camden High Street, London, N.W.1., will have available current and past issues of their popular magazine together with bound volumes of same and other publications of the company, as well as M.E.T.A. booklets.

Rozalex Ltd., 10, Norfolk Street, Manchester. An ordinary wash with soap and water will enable the model engineer to get his hands perfectly clean in a few minutes after a session in the workshop by employing the useful aid which will be shown and demonstrated by this firm.

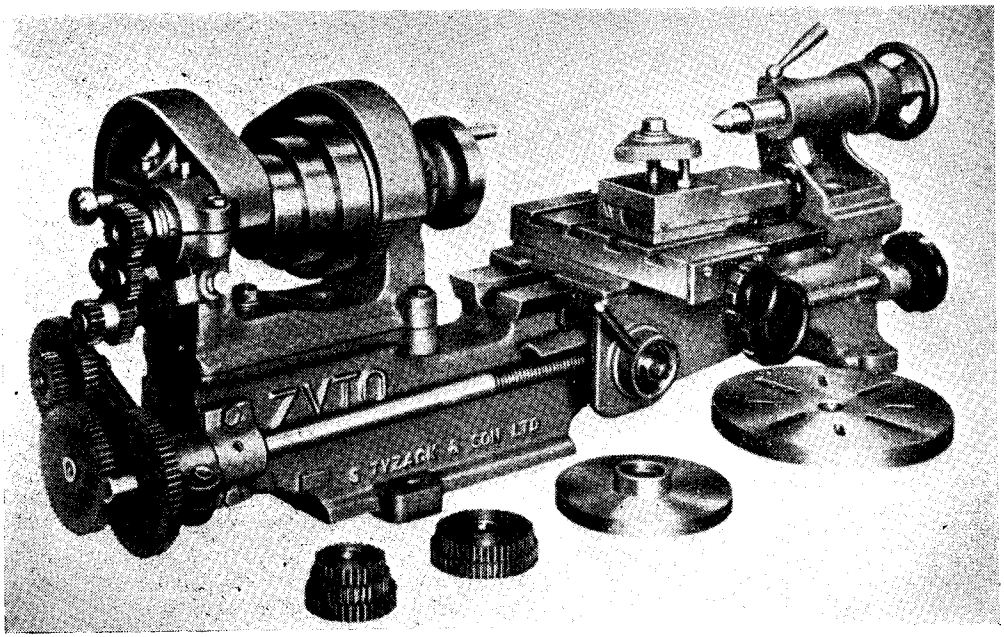
Dick Simmonds and Co., 5, South Road, Erith, Kent, need no introduction to our readers. This stand will contain a great deal in the way of castings, parts and materials for live steam locomotives in all sizes up to 5-in. gauge. They are suitable for most of "L.B.S.C's." designs, as well as for the popular "Ajax" which was brought out by this firm in 1949. Traction engine enthusiasts are invited to inspect the castings and parts for the 2-in. scale Burrell showman's engine, one of the most perfect examples of the type produced commercially.

Skarsten Mfg. Co. Ltd., 21, Hyde Way, Welwyn Garden City, Herts. Three entirely new tools just going on the market, the "Awl-screw," combination bradawl and screwdriver, the re-pointing scraper for old mortar, and a channelling tool for cutting channels in brick and concrete (for laying conduits, etc.) will be exhibited with the world-famous range of Skarsten scrapers. All who work in wood, or whose hobbies entail the upkeep of wooden surfaces such as are to be found in yachts and caravans will find a number of articles to interest them here.

Stuart Turner Ltd., Henley-on-Thames, Oxon. Here is another firm which needs no introduction to model engineers, and their products are equally familiar. Castings and parts for all engines in the well-known Stuart range will be available, together with finished engines, boilers, fittings and accessories. The reputation established many years ago by these products is fully upheld, and many model engineers whose first introduction to model engine construction was obtained through a simple set of Stuart castings, will find that they cater just as adequately for the more advanced and experienced worker.

S. Tyzack & Son, Ltd., 341-345, Old Street, London, E.C.1. Well known to all amateur and professional engineers as one of the oldest-established firms in the tool and equipment supply trade, Tyzack's are also familiar as frequent exhibitors at the "M.E." Exhibition, where they are showing their usual varied display of small tools, machine tools, and everything for the workshop. The new "Zyto" $3\frac{3}{8}$-in. lathe, introduced for the first time last year, is one of the attractions of this stand; it ranks as one of the most inexpensive screwcutting lathes on the market, and is available either as a bench lathe or on a stand, also with or without power drive equipment.

Victa Engineering Works, Ltd., Maidenhead, Berks. Among the machine tool specialities of this firm, special mention may be made of the Warwick $3\frac{1}{2}$-in. gap bed screwcutting lathe, which is recommended as specially suited to the requirements of model engineers. It has a capacity of 18 in. length between centres, and 10 in. diameter swing in the gap. The hollow

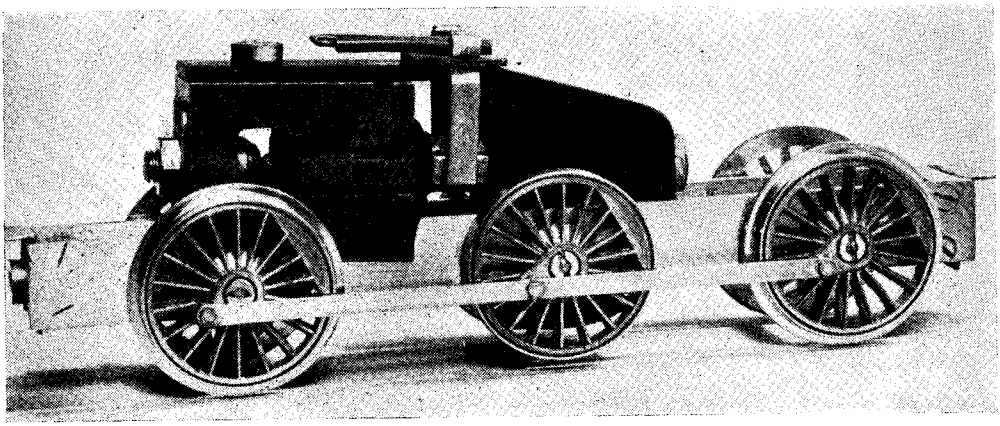


The "Zyto" 3⅜ centre back-geared screwcutting lathe

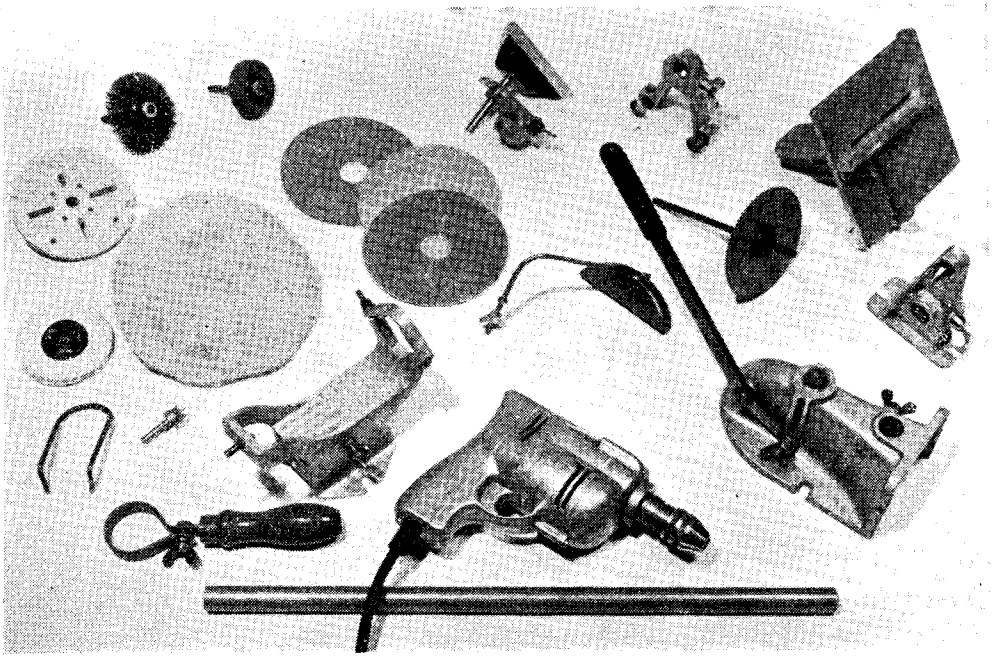
spindle has a bore of ⅝ in., and the set-over tailstock is of the hollow barrel type. It is supplied as a bench lathe, either with or without self-contained motor and countershaft unit. Standard equipment includes a faceplate, 10 change wheels and 2 centres.

A variety of other machine tools will be shown, including motorised drilling machines, shapers, millers and lathes of several types and sizes.

Walkers and Holtzapffel (Retail) Ltd., 61, Baker Street, London, W.1., are well-known specialists catering for miniature railways in 4-mm., 7-mm. and 10-mm. scales. Their stand will display selections from a very large range of products including locomotives, coaches, freight stock, track, signals, electric mechanisms, controllers and every kind of accessory the model railway engineer requires. The latest product is the "Romford" mechanism for "O" gauge; it appears to follow the same general design as its smaller and better known forerunner for "OO" gauge, and it is well worth consideration from all "O"-gauge enthusiasts requiring a reliable power-unit at a moderate price. This firm's 1950 catalogue, price 6d., is a considerable enlargement compared with any previously issued.



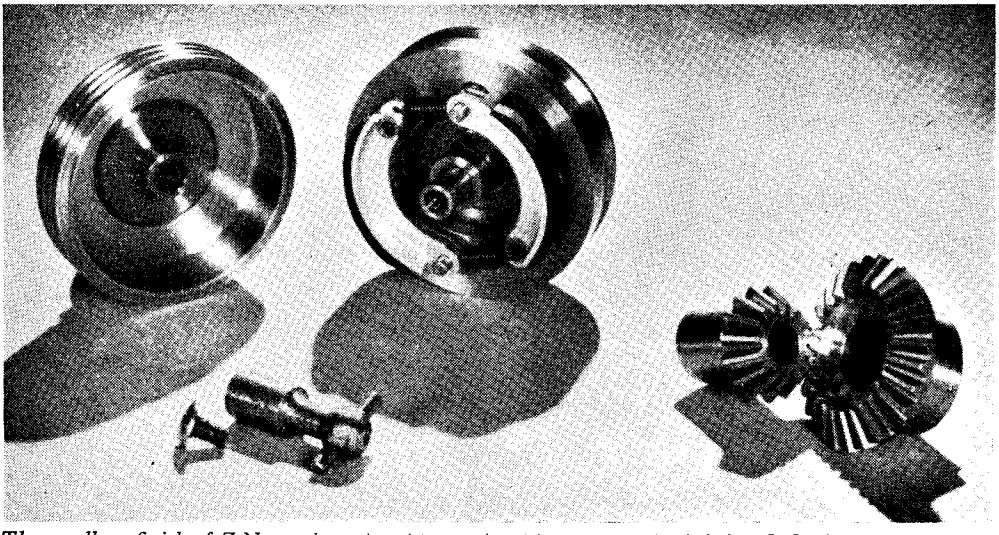
The "Romford" 6-coupled mechanism by Messrs. Walkers and Holtzapffel Ltd.



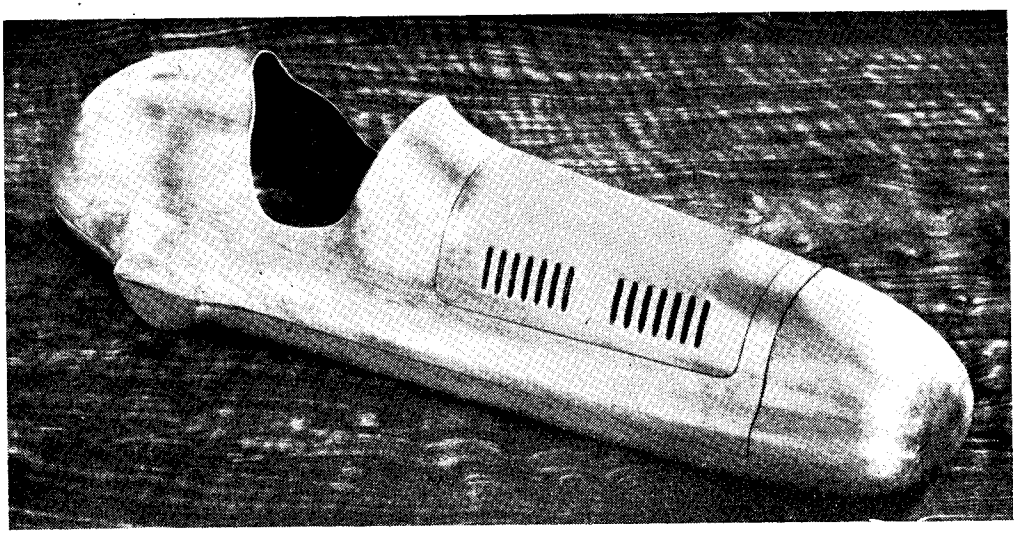
The fine array of Wolf equipment which, when assembled in a number of different ways, constitutes the various units of the Wolf Cub Home Constructor Kit

Wolf Electric Tools, Ltd., Hanger Lane, London, W.5. Besides the now famous Wolf Cub Home Constructor Kits, which will be of great interest to home constructors and model engineers alike, this well known firm will be showing a comprehensive range of their products. These will include portable electric grinders, drills, screwdrivers, sanders, blowers, hammers, chisel mortisers, bench and pedestal grinders, flexible shaft grinders, lathe grinders, solder guns and a complete accessory service for their machines.

E. P. Zere, Z.N. Motors Ltd., 904, Harrow Road, Willesden, London, N.W.10. Manu-



The excellent finish of Z.N. products is evidenced by this photograph of their 2 L.S. chuck and flywheel assembly and a pair of 1¾ : 1 bevel gears



The latest Z.N. beaten aluminium body for engines up to 10 c.c. capacity

facturers of some of the world's finest components for miniature race cars, Z.N. Motors will also be showing their full range of model aircraft pneumatic wheels, up to 6 in. diameter. Model car parts will include wheels for 2.5, 5 and 10 c.c. cars, bevel and spur gears, clutches and back axles, engine mountings, coils, fuels, beaten aluminium bodies for the M.C.N. Special, and a full range of spares for both British and American engines.

TRADE TOPICS

New "Surplus" Bargains

A PARCEL of assorted items in ex-Service equipment and components has been submitted to us by Messrs. K. Whiston, 8, Watford Bridge Road, New Mills, Nr. Stockport, and examination shows that these contain a great deal of material useful in the model engineering workshop, mostly in connection with electrical work. One item alone, which is sold at a very low price, is a multiple-point two-way relay which contains 12 tungsten and 12 silver contacts, besides two powerful electro-magnets, bearings, insulators, etc. A double selector relay also contains two magnets with ratchet mechanisms and contact gear, which can be used either as a "step" repeater, such as is used in a secondary electric clock, or to provide continuous rotary motion.

Another item is a small 27-V electric motor, supplied brand new, in sealed packing, which will run on either d.c. or a.c. supply of rated voltage, which in the latter case can be produced most efficiently by a transformer, but it is also possible to run it from the mains by putting a 300-ohm resistance in series with the motor leads; also a voltage regulator of the carbon pile type, which can quite easily be converted into a heavy-duty variable rheostat. In a small instrument component, two ultra-miniature bearings were found, which would be extremely useful in the construction of a high-speed gyroscope or turbine, or for the balance of an electric clock.

A very handy tool is a pair of miniature hand shears, about $5\frac{3}{4}$ in. overall length which is just the thing for small sheet-metal work, and may conveniently be tucked away in the emergency tool kit for track or pondside use.

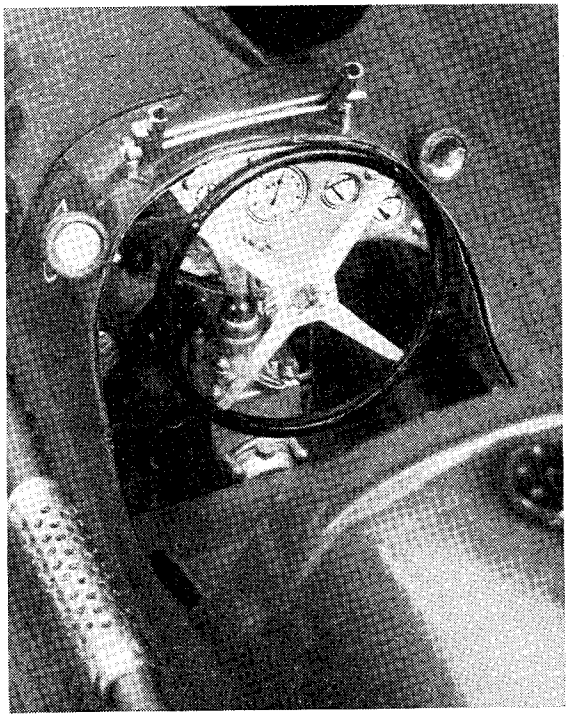
Tools and Materials

Messrs. Kennion Bros. (Hertford) Ltd. have recently sent us copies of two catalogues, one for small tools and the other for materials. In both cases, the goods offered have obviously been selected to meet the needs of the normal home workshop and cover very useful ranges of drills, reamers, milling cutters, files, screws, bolts, studs, taps, dies, sheet and rod metal in just those sizes which the model engineer is always requiring. The special hexagon *model* head screws, which are really beautifully produced and available in all sizes from 2 to 12 B.A., are especially to be commended to those model makers who dislike the appearance of the usual standard sizes. The catalogue is issued in the form of two small booklets and will be forwarded, upon receipt of 6d. in stamps, to home readers, or sent free to readers abroad.

*The $\frac{1}{10}$th Scale 4 CLT/48 Maserati

by Rex Hays

TURNING to the cockpit, we see in De Graffenreid's car that the frame, radius-arm mountings and the steering box are exposed to view, as I have illustrated, Fig. 6, but in Bira's car the steering box is located farther forward and is not seen in the cockpit; also, there are aluminium panels on either side hiding the frame and radius arms. The clutch-housing gearbox and oil tank I made in a combination of brass and beechwood—it was a complete unit with all the necessary bolts, nuts and pipeline attachments, not forgetting the Maserati insignia on the clutch housing inspection cover and the gearbox oil dipstick. The gear lever was turned in brass with a separate wooden knob. The ball housing was turned in brass and dull-chromed, the ball itself was also in brass and bright-chromed and threaded into its housing.



A view of the cockpit

The instrument panel was polished aluminium, bolted into position in the correct manner by 14-B.A. nuts and bolts.

The steering wheel spokes were fashioned from brass sheet and dull-chromed. The rim was turned in beech, drilled at four points, each point being filed out to a fine taper, and the spokes sprung into the rim at these points. The rim, incidentally, I left unpainted, but covered it with a fine coat of shellac.

It may be of interest to note that the diameter of the Maserati steering wheel is 16 in.

The seat was padded with cotton wool and covered with rough-cast paper which, when sprayed, gave a perfect representation of close-grained leather. The shoulder pad above the seat was treated in the same manner.

The armguard on the exhaust pipe was formed from a length of small-bore dural tube; to faciliate the drilling of the vent holes, I filed regular flats all round this tube, marked it out and drilled it, after which it was put in the lathe and the flats were turned off, the armguard being automatically reduced to the correct thickness. The bonnet fasteners are an interesting detail and were filed out of dural and drilled.

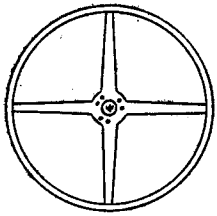
The windscreen frame I formed out of small-bore brass tube—it was composed of a base and two sides. The tube was first filed halfway through so that half the bore was exposed, the base of the frame and the two sides were then formed by soldering the ends to the base, thus forming a continuous channel to take the windscreen. The object of using small diameter bore was, of course, that when the assembly was formed, there was a sufficient thickness of metal to enable me to file away the radius on three sides, thus creating the desired square section. A windscreen frame built up in this manner can, of course, be bright-chromed, but in the case of De Graffenreid's car it was dull.

The radiator grille I made with a copper frame, starting handle aperture, and brass wire grille. There are no fewer than 46 solder points in the make-up of this item; the grille is, of course, plated.

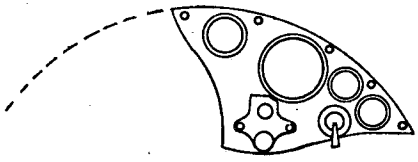
It may be noticed in the photograph that certain of the bars are uneven. Well, this was done purposely, as that was how De Graffenreid's grille looked at the time of his win in last year's British Grand Prix. As a matter of fact, it was found to be rather on the flimsy side, and today both De Graffenreid's and Bira's cars have a stronger grille fitted, the bars of which are quite straight across the frame, instead of having the curve in them.

One other feature is noticeable in the photo-

*Continued from page 102, "M.E.," July 20, 1950.



The steering wheel



The instrument panel

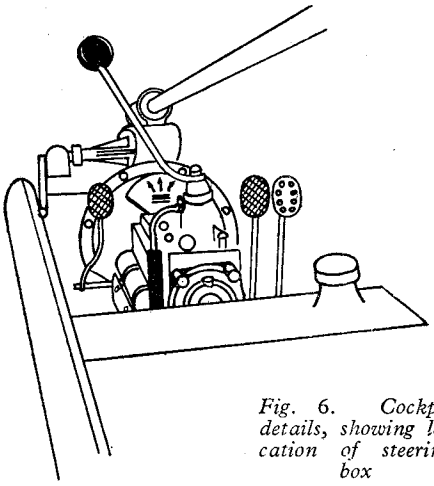
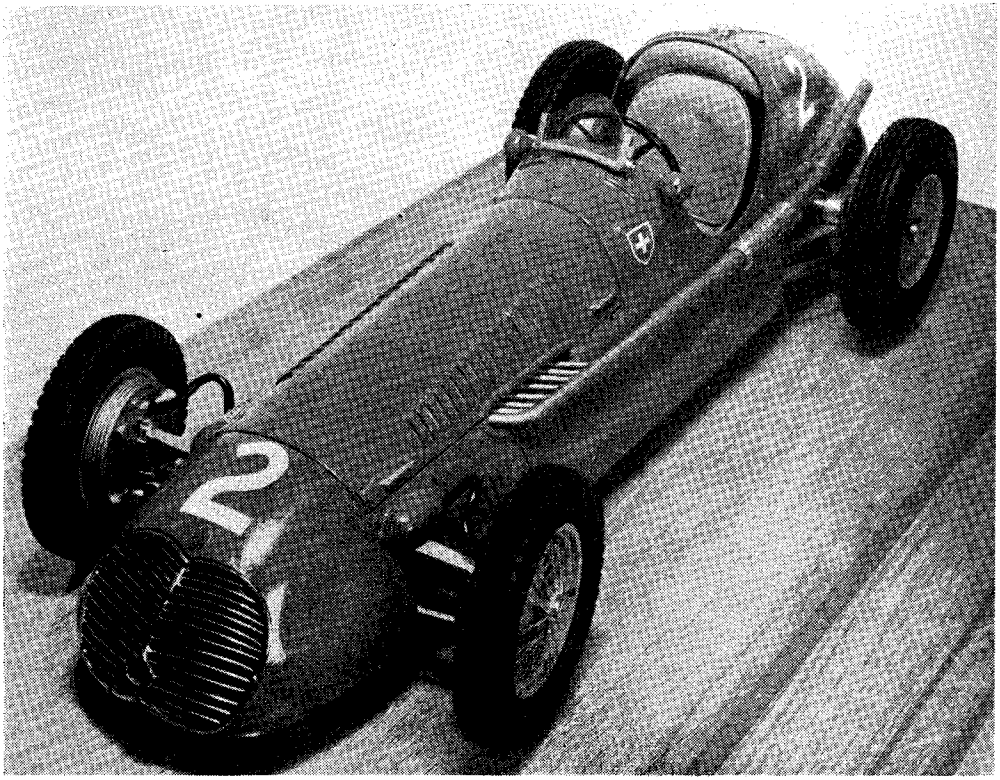


Fig. 6. Cockpit details, showing location of steering box

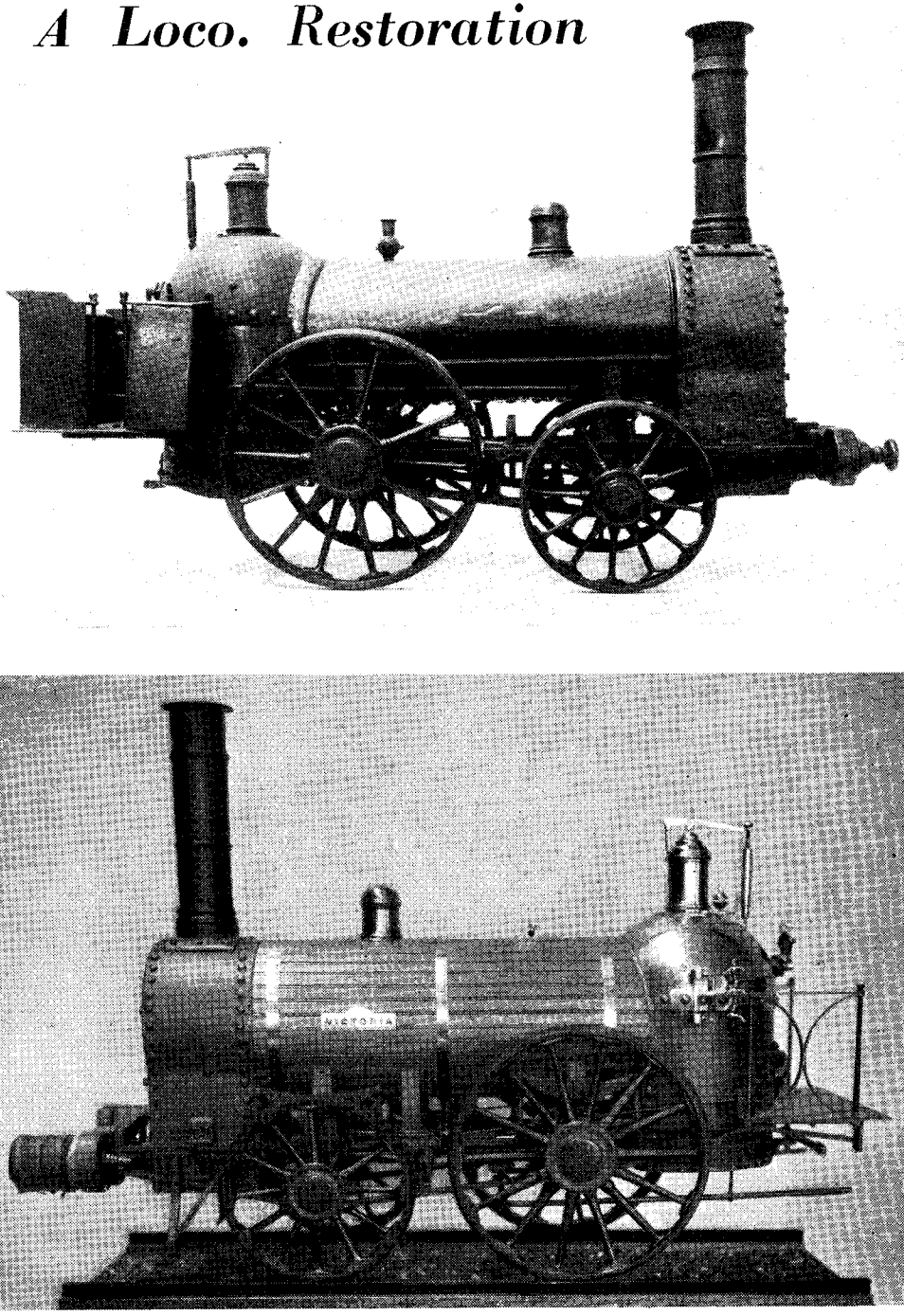
graph of the cockpit, and that is the apparent width of the near mirror frames. This was occasioned by some kind of rubber mounting for the glass which I noticed recently has been replaced with the normal mirror container.

Well, that is the make-up of the 4CLT/48 Maserati, and I hope that this article and illustrations have brought to light all the detail that is so elusive, and without which a model cannot be either very highly detailed or accurate.

It is an interesting and satisfying model to build, but, as I mentioned earlier, very deceptive in outline. It may be that, in its present form, the 4CLT Maserati will be outclassed by Alfa Romeo and Ferrari; but it has enjoyed some grand and resounding victories, and is very worthy of an honoured place among any collection of models of famous Grand Prix racing cars.

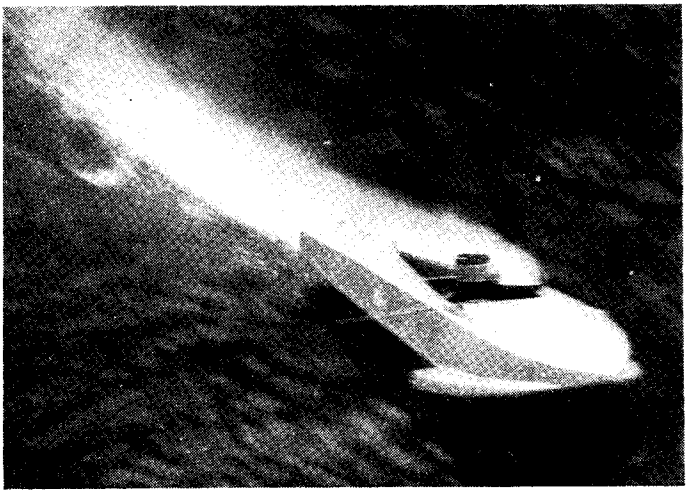


A Loco. Restoration



These two photographs are thought to depict a model of the London & Brighton Railway Locomotive "Victoria" of about 1830-3. The model is in Edinburgh Museum; the top picture shows it as received, and the lower one as restored by the Museum authorities

The Blackheath Regatta



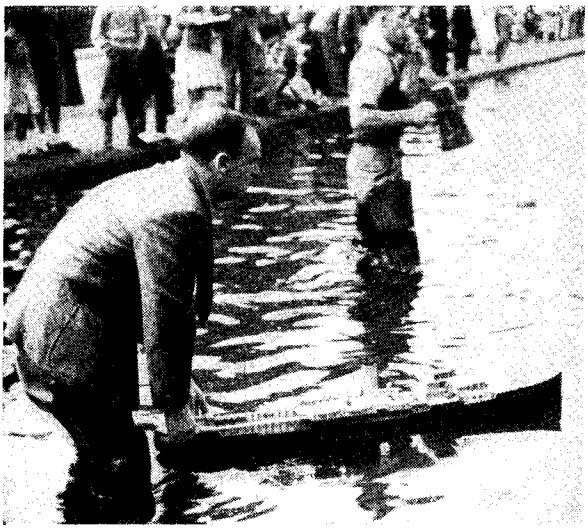
Mr. A. Stone's " C " class boat " Toots " at full speed

THE Blackheath Model Power Boat Club held their annual M.P.B.A. regatta on a recent Sunday, and this year's event proved very successful, although the high speeds that this regatta usually sees were, in the main, absent.

The Princess of Wales pond, which is a good water for speed craft, had any advantages negatived by a breeze, which, coming from the Blackheath side of the pond, caused the water to be a bit " bumpy." This of course affected speeds in general, especially those of the new Class " D " boats.

The straight running boats put on their usual reliable show, but of course the above-mentioned wind showed its effect in the steering, some of the boats misbehaving badly in this respect.

Good support was forthcoming from the various clubs, the following being represented : Victoria, Orpington, N. London, S. London, Kingsmere, Malden, Southampton, Guildford, Croydon and Swindon, besides the home club.



Mr. Griffiths (Blackheath) running his electrically-driven boat " Orange Leaf " in the nomination race

First event of the day was a 50 yd. nomination race and the straight runners, 25 in number, took their turn across the course. The winner of this race was E. Walker with *Coron*, which was ½ sec. out in the estimated time.

This is the first time that *Coron* has been out to a regatta this season, but it made a highly successful start.

A lot of boats muffed their chances by poor steering, although the wind, which was almost head on, was partly responsible.

The 300 yd. Class " D " race proved to be a somewhat melancholy procession of non-starters and non-stayers. Of an entry of seven boats only two—both of the home club, managed to complete the three laps necessary. These two boats were owned by Messrs. Dearling and Thomas, and are both new to regattas. The best speed was recorded by S. Dearling's boat with a speed of 23.8 m.p.h.

F. Walton (Kingsmere) ran two boats in this race, but had no luck with either, both capsizing on one run, and on second attempts stalling on the getaway.

The 300 yd. " C " class and " C " restricted events came next, and of the Class " C " boats only L. Pinder's *Rednip* returned a time, and thus was the winner of the Class " C " prize.

G. Stone (Kingsmere) ran both *Lady Babs* and *Rodney* in the " C " restricted race, and both did similar performances for the distance—about 39 m.p.h. *Lady Babs*, however, did a lap or two at about 60 m.p.h. after the three timed laps had been completed. C. Cray (Kingsmere) did 43.9 for the vital three laps, with a new boat and his speed was unbeaten at the finish. No one bettered their speeds on the second tries, but A. Stone (S.London) recorded exactly the same speed (38.4 m.p.h.) on both attempts in spite of

changing propellers !

Due to the fact that the "D" class race had used up more time than was allowed, the lunch interval had to be curtailed a little, and upon resuming the regatta continued with the steering competition.

As might have been expected, misses were frequent in this event and even such old hands as Ted Vanner scored three "blobs" with *Leda III*. Several boats, after scoring a bull, were right off the mark in the subsequent runs. The highest score was 9 points—three inners by J. Hood (Swindon) with his fine steam-launch *Truant*. A. Rayman (Blackheath) with *Yvonne* scored 8 ; while Messrs Benson and Curtis tied for third place with 7. On the re-run J. Curtis scored a bull, while J. Benson could only manage an outer.

Mr. A. W. Cockman with his latest boat "Ifit VII" which was put out of action by a mishap in trials before the regatta

A 500 yd. Class "A" race came next, and this brought forth about half-a-dozen entries. Speeds were lower than usual for this class, although *Gordon* 2 by E. Clark (Victoria) did some fast laps after the five actually timed. A welcome entry was that of B. Pilliner (Southampton). His boat *Ginger*, is one of the few flash steamers about these days, and represents a lot of ingenious work.

J. Innocent's *Betty*, in spite of a run with the engine misfiring, put up the best speed. On a second run the engine cut-out after just crossing the start, a great pity, as the boat showed signs of really going.

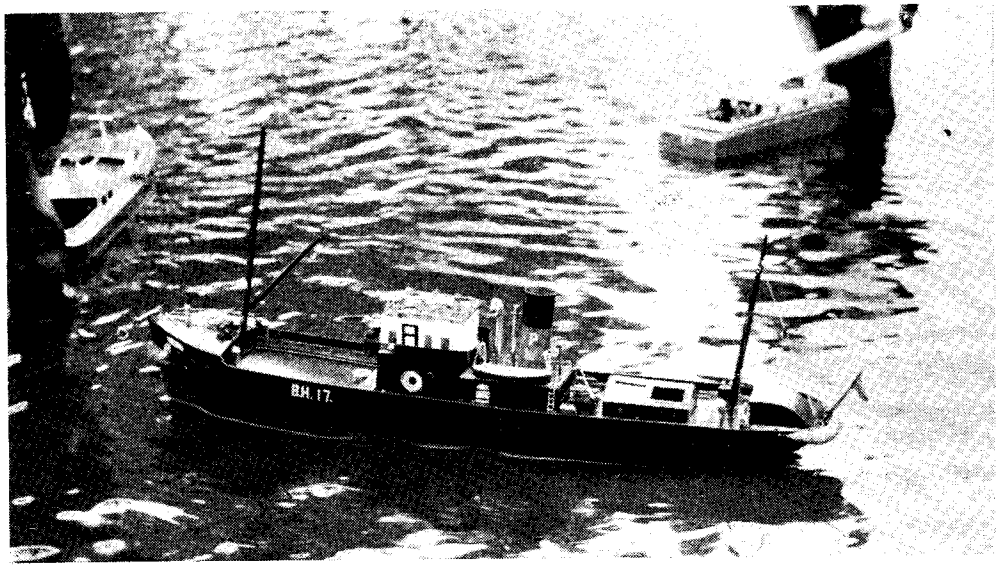
B. Miles (Kingsmere) with *Typhoon* was out of luck, but W. Parris (S. London) with *Wasp* managed to get a run at 34.3 m.p.h. Second place was taken by B. Pilliner with *Ginger* (34.8 m.p.h.)

The final event was a 300 yd. Class "B" race, and this race gave the best winning speed of the day, F. Jutton with *Vesta II* recording 51.1 m.p.h. G. Lines (Orpington) with *Sparky II* had capsizes on both runs, both times at high speeds, and both times at exactly the same place. Second place went to N. Hodges (Orpington) with *Sparta* with a speed of 33 m.p.h.

Results

Nomination Race, 50 yd. Course.—1st E. Walker (Kingsmere), *Coron* : error 0.5 sec.

(*Continued on page* 139)



An excellent example of a prototype steam model by Mr. Pinchin, of the Blackheath club

Improvements and Innovations

No. 9—*Continuous* Bad Driving

by "1121"

WHEN, some moons ago, we sent off our two articles "Dangerous Driving!" and "Just *Bad* Driving," we produced the little drawings that went with them more for our own amusement than anything else, in some doubt as to whether the editor would consider such flippant matter suitable for the pages of an august technical publication. When, however, said editor not only publishes them, but sits back and demands more, what is a poor contributor to do?

Having thus become faced with the problem of recollecting, describing and illustrating still more faults in locomotive driving than those we had considered as pretty well covering all circumstances, we got busy on the theme of undesirable carryings-on as observed among drivers on continuous tracks, as this type of running introduces aspects of the safety problem not met with on the straight up-and-down work with which we have so far dealt.

We will therefore begin this collection with

The Bulldozer

The Bulldozer

This gentleman is the proud possessor of an engine which is so fast, and so immune from any form of delaying influence itself, that he suffers the most painful exasperation when he finds the road blocked by somebody less fortunately equipped. His outlet for these feelings is to bump the train in front, more or less continuously, in an endeavour to urge it to an improvement in velocity. This process has a noticeable effect on the fingers of the other driver concerned, as he has probably slowed down to open his firedoor and minister to the fire, and has further and more spectacular results on a sharp curve, as it induces buffer-locking between the front of the engine and the tail-end of the preceding train, which can only be remedied by a display of energetic whistling, shouting, and waving of arms.

The Shuttlecock

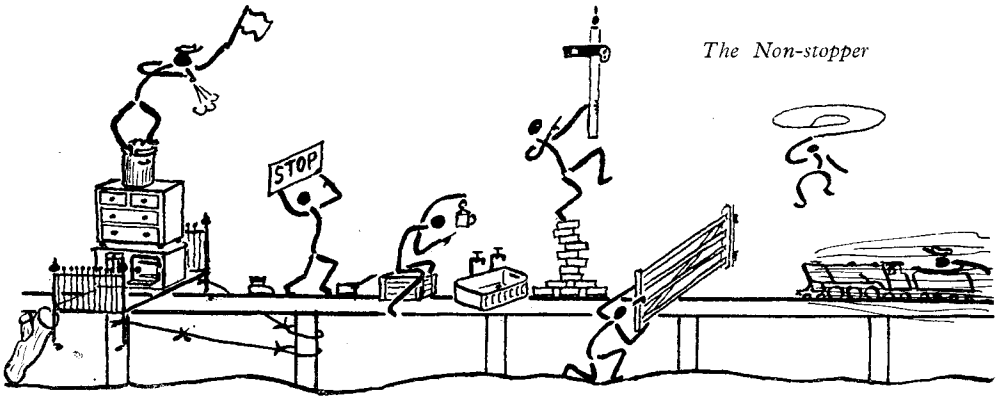
This client also suffers from impatience with the train in front, but in his case it gets so bad that he finds it necessary to reverse and run backwards round the circuit as fast, and as far as he dare without actual encounter with the next man following. We have, nevertheless, seen cases of faulty judgment in this respect, which, when combined with lack of observation on the part of the oncoming driver, can have the most dramatic results.

The Sleeper-hopper

It is frequently a source of some surprise to locomotive owners to discover the limitations of engines when it comes to the negotiation of curves. There are many points in the design of an engine, besides mere length, which can severely interfere with its flexibility, and just because Mr. A's *Galloping Sausage* will go round a curve of 30 ft. radius it does not follow that Mr. B's *Perambulating Biscuit-Box* will do likewise. Thus we have seen Mr. B, on many occasions, glaring venomously at his engine because its front bogie refuses to stay on the rails, and have ourselves glared at both it, and at Mr. B himself even more so, when that gentleman has proceeded either to remove the bogie altogether, and run round the curves with the inside buffer somewhere over the outside rail, or to continue running with the bogie clattering along over the sleepers. We once observed an engine to be running in this latter manner, while hauling train-loads of children, and pointed it out to the driver, thinking he was not aware that his bogie was off the road. His reply was, "Oh, yes, it always does that," and the reaction of the organiser of the railway, when his attention was drawn to this dangerous state of affairs, was expressed as—"Oh, well, we're free and easy here."

The Non-stopper

We think this is a suitable opportunity to mention a person who causes more annoyance than direct danger; we include him in our list, as he represents a type whose attitude of carefree independence of the rules made by those



The Non-stopper

upon whose track he is running makes him a potential danger, as he is just as likely to ignore other rules having a more direct bearing on the safety question. He is the man who, when reputedly engaged in public passenger-hauling, refuses to stop and change passengers at the appointed times, insisting on continuing round and round the track until *he* thinks the time has come to stop. This is when he has run out of coal, water, oil and everything else, and he then demands hectic co-operation from all within call before traffic can be resumed. We have no doubt that his long continuous runs are highly entertaining to the passengers thus favoured, but they constitute nothing better than a pain in the neck to the tormented soul trying to organise the traffic, with a long queue of waiting passengers on his hands, and the necessity for explaining to a menacing gaggle of mothers why their particular angelic offspring were allowed only one trip round the track, when Mrs. Thingummy's insufferable brats were treated to half-a-dozen.

The Astronomer

When this next gentleman *does* come down to earth and condescend to bestow one of his rare glances at the track in front of him, it is usually with a glassy-eyed expression, of little use as a means of ascertaining the state of the road, his principle being " look without seeing," or better still, " don't look at all." The result is that should he even be looking straight at an obstruction, he fails to see it until he has hit it, and looks to see what he has hit.

On a certain continuous ground-level track which was in frequent operation before the war, we had an infallible test to discover such people. It consisted simply of attaching to one end of a piece of string some startling, but easily-moved object (usually a blue saucepan, for some unknown reason). This was installed on the track at a point where visibility was limited, by a bend, to three or four yards, and the other end of the string was held by an operator, out of sight of the driver, but sufficiently close to the track to enable him to impart the necessary jerk to the string to remove the obstruction at the critical moment. The reactions of most drivers, on observing the saucepan, were as those of a rabbit petrified by a snake. They either stared at it open-mouthed, sometimes even with a hand on the brake, but powerless to apply it until long after the obstruction had miraculously disappeared, or else they were taking so little interest in the road ahead that they failed to see the saucepan at all, and, having passed the spot in blissful ignorance of the menace lurking there, looked round in bewildered astonishment on hearing howls of laughter from the assembled multitude.

The Blackheath Regatta

(*Continued from page* 137)

2nd J. Benson (Blackheath), *Comet* : error 1.3 sec. 3rd J. Jepson (Blackheath), *Darky* : error 2.05 sec.

300 *yd. Class* " *D* " *Race.*—1st S. Dearling (Blackheath) : 25.8 sec., 23.8 m.p.h.

300 *yd. Class* " *C* " *Race.*—1st L. Pinder (Malden), *Rednip* : 15.2 sec., 40.6 m.p.h.

300 *yd.* " *C* " *Restricted Race.*—1st C. Cray (Kingsmere) : 14 sec., 43.8 m.p.h.

Steering Competition.—1st J. Hood (Swindon), *Truant* : 9 points. 2nd A. Rayman (Blackheath) *Yvonne* : 8 points. 3rd J. Curtis (Victoria), *Micky* : 7 points.

500 *yd. Class* " *A* " *Race.*—1st J. Innocent (Victoria), *Betty* : 28.4 sec., 36 m.p.h. 2nd B. Pilliner (Southampton), *Ginger* : 29.4 sec., 34.7 m.p.h.

500 *yd. Class* " *B* " *Race.*—1st F. Jutton (Guildford), *Vesta II* : 12 sec., 51.1 m.p.h., 2nd N. Hodges (Orpington), *Sparta* : 18.6 sec., 33 m.p.h.

Novices' Corner

Making a Centre-finder

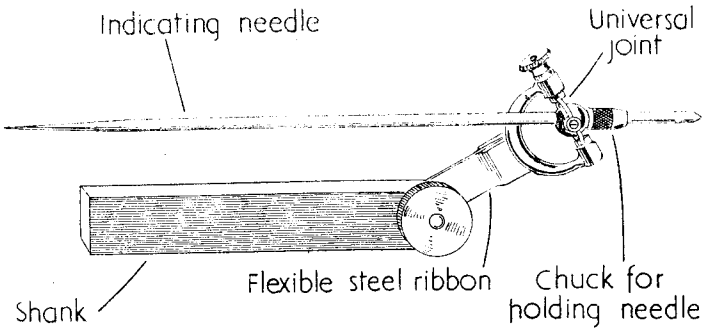


Fig. 1. The Starrett pattern centre-finder

THE use of a centre-finder, or "wobbler" as it is sometimes called, has so often been referred to, as a means of centring work in the lathe chuck, that a description of how to make and operate one of these appliances may be helpful to many less-experienced workers.

When it is required to set a piece of work in the lathe chuck to run truly about a drilled centre, the coned tip of the centre-finder is engaged with the centre mark, and the shank of the appliance is supported by some fixed part of the lathe such as the tailstock centre. The parallel portion of the body of the finder may then be set to run truly with the aid of a test indicator applied close to the tip.

The Starrett pattern centre-finder, illustrated in Fig. 1, is mounted in a universal joint carried on a flexible spring arm which serves to keep the needle in contact with the work.

With the appliance mounted in the lathe tool post, the tailstock centre is set close to the tip on the indicating needle, and when the work is revolved the greatly magnified excursions of the indicating point will at once reveal any lack of truth in the centring of the work.

In a similar manner, the work can readily be set while stationary, merely by bringing the point of the indicator needle into line with the tip of the coned tailstock centre. For centring bored work, a ball is provided which can be secured to the tip of the contact needle.

The construction of a centre-finder of this type is necessarily somewhat complicated, but the simple device illustrated in Fig. 2 will be found fully efficient for general use; true, the work cannot be centred so quickly, but a high degree of accuracy is assured as the setting is controlled and checked with the test indicator.

Both the general appearance and the constructional details of the appliance should be made clear by the working drawings given in Fig. 2. The body may be made from a straight length of mild-steel rod, which should be tested for straightness by revolving it when gripped in a true-holding chuck fitted to the lathe or drilling machine. If there is any doubt on this score, it is advisable to machine the material to size when mounted between the lathe centres and supported by the travelling steady.

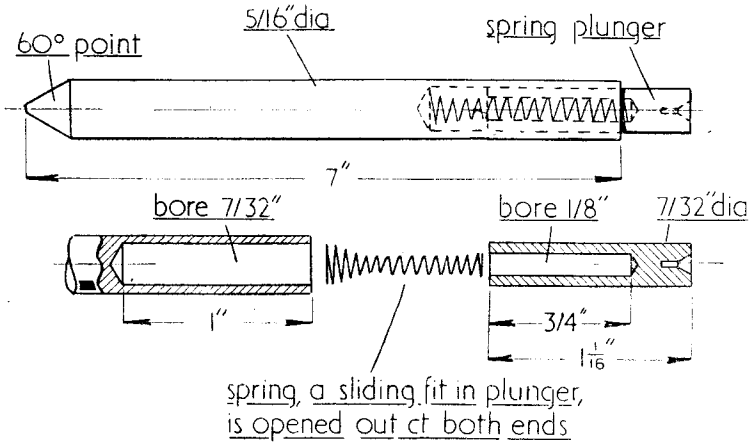


Fig. 2. An easily-made form of centre-finder

As an alternative, a length of ground, silver-steel rod may be used, for not only is this material straight, but it has the advantages of greater stiffness and better resistance to wear.

The exact length of the body part is unimportant, but it should be sufficiently long for convenient working across the full breadth of the lathe saddle and, at the same time, space must be allowed for mounting the test indicator.

As the setting of the work is measured from the parallel portion of the end of the wobbler's shank, it is essential that this surface should be truly concentric with the conical tip.

The material is therefore set to run truly in the four-jaw chuck, with the aid of the test indicator, and, as represented in Fig. 3, the coned portion is turned to an included angle of 60 deg. by setting over the lathe top slide and taking

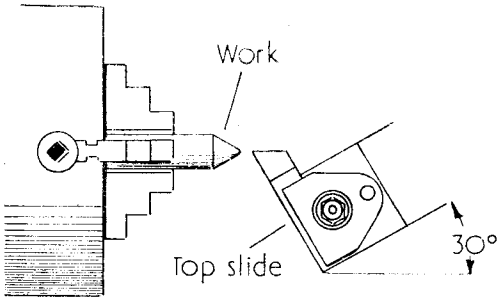


Fig. 3. Turning the conical point of the centre-finder

light cuts with a knife-tool. There is no need to finish this part to a sharp point as long as it will engage fully in a recess formed by the smallest size of centre-drill ordinarily used. In fact, a sharp point in this situation will be more liable to be damaged and to cause damage than if a small flat is left at the extreme tip. Next, as represented in Fig. 4, the rod is reversed in the chuck and again set to run truly so that the bore to receive the spring plunger can be accurately machined. This hole should be carefully drilled ; first, with a small centre-drill and then with a larger centre-drill having a $\frac{1}{8}$ in. diameter point. The object of this is to provide a true-running guide hole for the $\frac{1}{8}$-in. diameter pilot drill which follows to form the bore to the full depth.

Finally, the hole is enlarged to the finished size with a 7/32 in. diameter drill. On the other hand, it will be clear that the bore to receive the plunger can be formed concentrically with less chance of error if it is first drilled slightly under-size and then finished with a small boring-tool. The central mounting of the plunger is, however, of less importance than the accurate centring of the coned point, for an error of, say, 1 thou-sandth of an inch at the tail end of the body will represent, perhaps, only a tenth of this amount near to the point.

This completes the machining of the body portion, and the plunger should next be made in accordance with the working and operational drawings.

As illustrated in Fig. 5, a short length of $\frac{1}{4}$-in. diameter steel, preferably silver-steel rod, is gripped in the self-centring or four-jaw chuck and turned down to form a close but free sliding fit in the end of the body.

After the end has been faced and drilled with a small centre drill to form a working centre, the plunger is parted off to the finished length. The next step is to reverse the part in the chuck for drilling the axial hole to receive the spring. The diameter of this hole will depend on the size of the spring fitted ; but, in any case, the spring should be a free, sliding fit in the bore. The kind of spring material used in petrol lighters will probably be found to serve well for actuating the plunger.

It now remains to fit the spring in place, and at the same time this is so arranged that the plunger is retained in the body portion and kept from falling

(*Continued on page 145*)

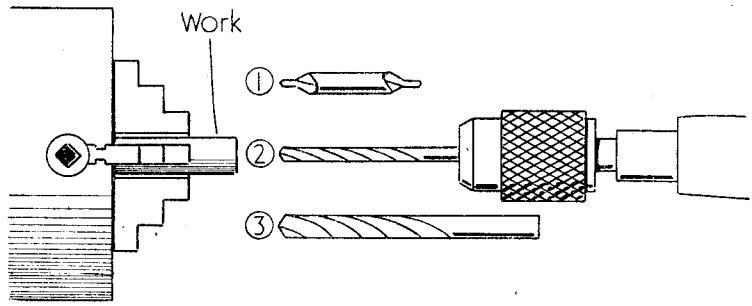


Fig. 4. Forming the bore for the plunger in the body of the centre-finder

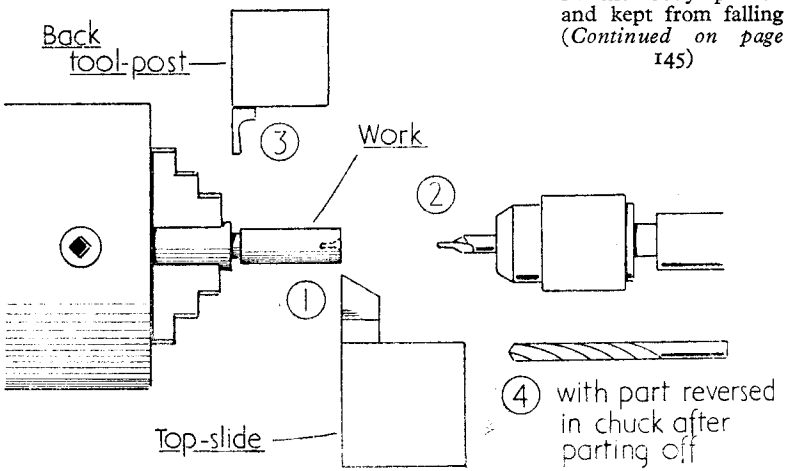


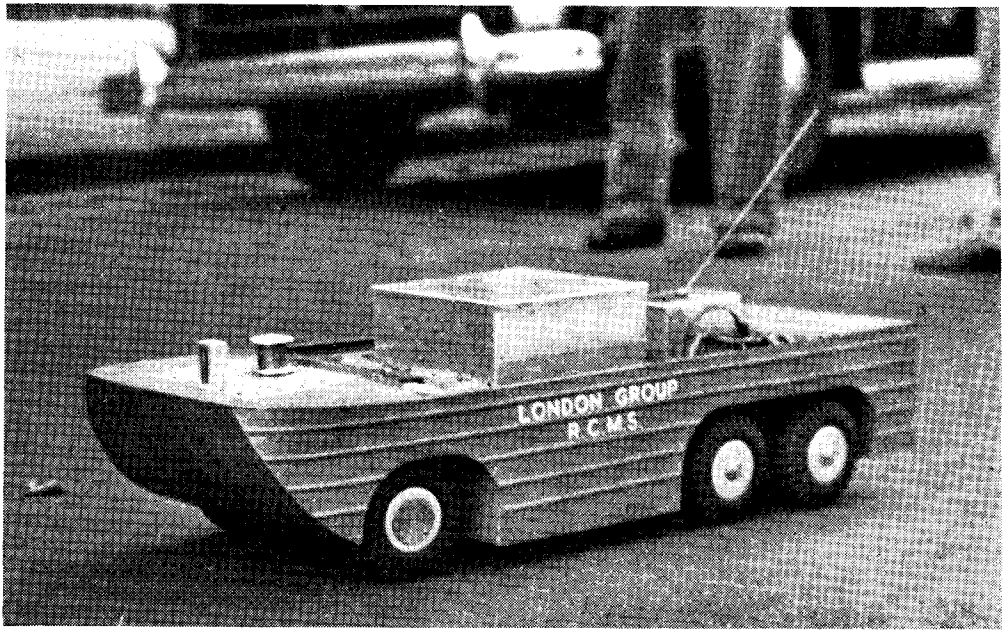
Fig. 5. Machining the plunger

A Radio-Controlled Model "DUKW"

by G. C. Chapman and P. A. Cummins

THIS radio-controlled model was built by some twelve members of the London Group of the Radio-Controlled Models Society, as a challenge to the Manchester Group. It reached a sufficiently advanced stage to be operated successfully in the arena at the Model Engineer Exhibition, 1949.

Thirty-two demonstrations were given, each of approximately twenty minutes, apart from runs on the stand and outside hours; the model travelled about 30 miles, or nearly 300 scale miles, all without serious mishap.



The Model

This was restricted by the terms of the challenge rules to 3 ft. long, 18 in. wide and 18 in. high excluding aerial. The machine was designed to an overall length of 3 ft., and came out with a beam of 13 in., and a height to deck of 8 in. The scale is approximately 1/9 full size. The general arrangement finally accepted and shown in Fig. 1, was based on the memories of DUKW's of several people who had used them; and as no photographs or accurate plans were consulted, the model is not truly a scale one. Fortunately, few DUKW's are in circulation today, so there is little adverse criticism!

The hull was built from tin-plate, riveted and sweated together like an odd-shaped biscuit tin. The corrugations in the sides and front were made on a rolling machine. Stiffening of the hull was provided by $\frac{3}{8}$ in. brass angle and channel sections, forming each side into a girder, and connected across at the stern. Strength forward was provided by the framework which supports the winch, and by the permanent metal deck there. The wheel boxes were quite rigid and were reinforced by $\frac{1}{16}$ in. brass sheet to take the axle bearings. Between them was placed a brazed-up brass framework which carries the wheel motors and the radio generator directly, and provides indirect support for the two banks of accumulators, at either side. The propeller tunnels (involving the only tricky metal working, the hammering out of the flanges) reinforce the after well. The stern tubes and brackets, of brass, were soldered to the tunnels (*see* Fig. 2 and 3).

Meanwhile the wheels, differentials and rear axle-arms had been made. The wheels are built into the Dunlop "Trak Grip" tyres, 5 in. diameter, which are solid rubber, and of pleasing appearance. Dural discs form the hubs, which are bolted together into the tyres, and carry ball-bearings and/or driving spiders as required. The main driving wheels are the forward pair of the after wheels; they are connected by the internal spiders to the axles projecting from the extensions of the rear differential housing,

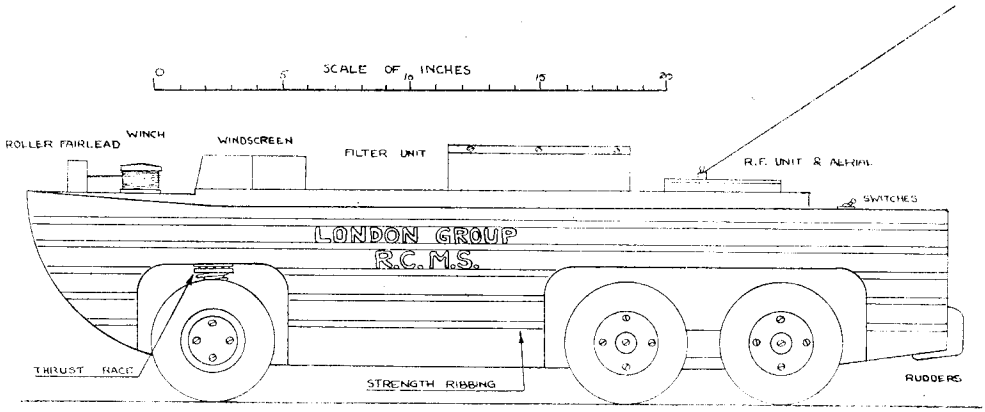


Fig. 1. Side elevation

which also carry the rear axle arms. This rear differential casing is bolted to the sides of the wheel-boxes with flanges and watertight packing, and the whole assembly is demountable. These two wheels are not sprung. Carried on the casing extension are the rear axle-arms, projecting from whose rear ends are the $\frac{1}{4}$ in. stub axles on which run (on ball-bearings) the rearmost wheels. There are stops to limit the travel of the arms, but no springs, so that the rear wheels support only their own weight. They are not driven, and follow the undulations of the ground independently.

At the forward end, two $\frac{3}{8}$ in. vertical king-pins are carried in steel brackets attached to the tops of the wheel-boxes : below these, and inside the wheel-boxes, are successively a ball thrust-race, a compression spring, and the right-angled steel " axle block." Thus the weight on the front wheels is taken to the hull *via* the spring and the bearing, giving independent springing forward, with about $\frac{3}{8}$ in. overall vertical travel. When loaded, there is about $\frac{1}{4}$ in. travel available. Projecting outwards from the axle blocks are the forward stub axles, steel, $\frac{1}{2}$ in. o.d., $\frac{3}{8}$ in. i.d. completely hollow. The wheels run on ball-bearings on these axles, the torque being transmitted through a $\frac{1}{8}$ in. flexible shaft from the watertight hull bearing, through the stub axle, to a spider bolted to the *outboard* side of the wheel. These details are shown in Fig. 3.

At the watertight bearing the flexible shaft is sweated into a $\frac{1}{4}$ in. o.d. brass tube ; the bearing is plain phosphor bronze, accurately machined, so that when well greased it is watertight. Inboard the $\frac{1}{4}$ in. brass axles are connected to the differential output axles by pinned sleeves ; the front differential does not have the extensions and axles as are fitted aft. The two differentials are otherwise identical, being made in brass casings from bomb-sight computer gears. The gear ratio is 2 : 1. The king-pins pass through a brass tube incorporated into the steel brackets so that in the water the top of the bracket is above water level, and a watertight gland is not required. Immediately above this, and almost

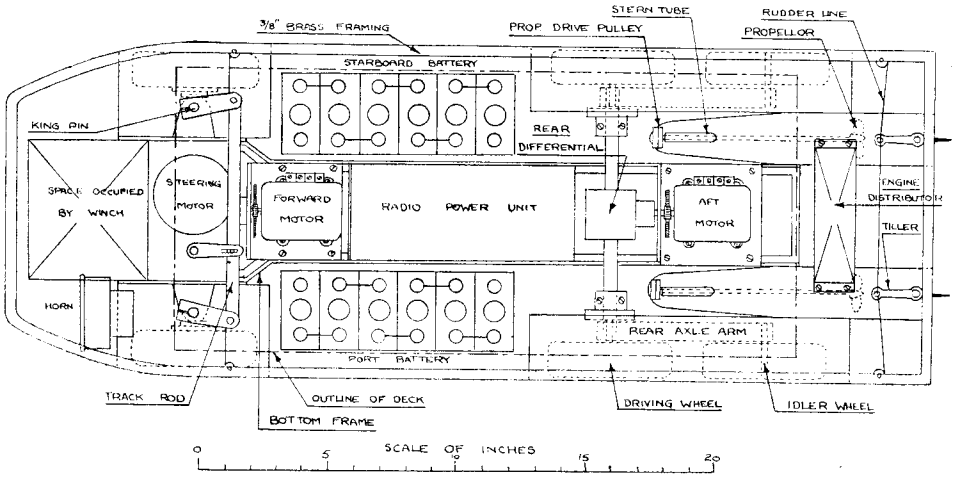


Fig. 2. Plan, with deck, filter unit, R.F. unit and propeller motors removed

at deck level, are fitted 1½ in. (between centre) arms and the track bar. The wheels do not pivot about the points of contact with the ground, but about the points of emergence of the flex shafts from the stub axles. Sideways travel (relative to the DUKW) of the ¼ in. brass axles is negligible even when the wheels are put to full lock of about 30 deg. As a result of this simplification (compared with full-size practice) more torque is required *when at rest* to move the steering, but even at slow speed this is very much reduced, and the steering motor, ratchet driven, is then able to function perfectly.

With all the above items completed, some experiments were made, and two similar ex-bombsight computer motors, shunt wound, rated at 27 V, 1.5 A, were found to be suitable. The fields are permanently connected to 24 V, passing about ¾ A each, and the voltage supplied to the armatures is varied in direction, and from about 6 V upward, to give direction and speed control. The motors are bolted to wood supports, in turn on brass plates, which rest on the central brass framework. $\frac{5}{16}$ in. pitch diameter pinions on the shafts drive 2 in. wheels on the differential input shafts—a 6 : 1 reduction, which, combined with the differentials, gives an overall 12 : 1.

When fully laden, 8 and 12 V on the armatures give 1.6 m.p.h. and 2.9. m.p.h. respectively, and these are normally taken as half and full speed respectively. On full 24 V, a man has to run to keep up—the speed is 6½ m.p.h. This represents a scale speed (Froudes square root of the linear scale law) of 20 m.p.h.

The propellers are 3-blade 1½ in. diameter with brass blades brazed on to turned brass bosses ; the shafts are ⅛ in. ground silver-steel. Drive is by two 3/32-in. coil spring belts per shaft from two independent 12-V motors, slung from a wood cross-piece running across the tops of the after wheel-boxes. At about 3,000 r.p.m. these motors give a speed of 1½ knots in water, with about 6½-in. draught.

One rudder is fitted in each propeller tunnel, about ½ in. projecting outside astern. The posts pass up inside tubes in the DUWK which provide support and a water seal. Conventional tillers and wires are connected to the wheel track bar *via* pulleys, including a reversing pulley, so that the steering-wheel moves the front wheels and rudders in the correct corresponding directions.

Right forward is a space which carries a winch ; a wind-screen wiper motor drives a drum on deck carrying wire, which is led outboard through a roller fairlead. Also in this space forward is the horn.

Between the forward wheel-boxes and above the differential, is the steering motor. On either side of the radio H.T. generator are the 12-V, 7-A hr. Type MR2A lead-acid accumulator batteries, and above is the filter unit. Bolted to the wood cross-piece carrying the propeller motors is the R.F. unit of the receiver, and immediately aft of this the aft deck. On this are the various switches, and suspended below it the engine distributor. On either side of the model the decks are 1 in. wide, and all round the inside of the decks is a 1 in. coaming.

The Radio Control Equipment

This provides simultaneous control of three functions, namely, steering, engines and auxiliaries. The steering and engine controls are " proportional," which means that any movement made by the appropriate control at the transmitter is reproduced immediately by the corresponding mechanism in the model. Steering is effected by a step-by-step method, which will be described in detail later, and engine control by means of a five position selector switch. The auxiliary control originally fitted enabled the winch to be started and stopped, but this was modified later to operate a small motor horn from a conventional " button " on the control panel.

A 465 Megacycle radio link is used, with multiple audio frequency modulation providing five independent control channels. The selectivity in the filter circuits in the receiver is such that any combination of the five channels may be used at any instant, which means that if necessary all controls may be in operation simultaneously without any interference between them. Two of the channels are used for steering, two for engine control, and the remaining one for blowing the horn.

In order to appreciate the way in which these controls are effected, all that needs to be understood is that when any signal is " turned on " at the control panel, a corresponding relay in the receiver operates. The maximum rate at which any relay can be made to operate is 30 times per second, and the time that elapses between the making of any control contact at the transmitter and the closing of the corresponding relay contacts is 10 milliseconds, or one hundredth of a second.

The steering " motor " in the model consists of two electrically-operated ratchet mechanisms connected to the two input shafts of a differential. The ratchets are reverse acting, which means that operation of the magnet lifts the pawl into the next tooth, and upon the release of the magnet the return spring rotates the wheel. At the end of its stroke the pawl strikes a stop which locks it and positively prevents any overshoot of the wheel. In addition, when the pawl is in its rest position the ratchet is irreversible. The two ratchet wheels are arranged to rotate in opposite directions relative to the differential so that a reversible output drive is available from the planet cage, since the ratchet wheel not in operation at any one time is locked to the frame. The torque developed by the motor is decided by the tension on the return springs, and is thus under precise control. The maximum speed at which the motor may be stepped is decided mainly by the number of ampere-turns on the magnets. From the foregoing description of the ratchet system it will be seen that when neither wheel is being rotated the output shaft is locked and the steering mechanism irreversible. Each magnet is operated by one of the relays in the radio receiver and the way in which these are selected will now be described.

The steering control at the transmitter consists of a wheel which rotates a pulsing device. The gear ratio is arranged so that two and half turns of the wheel produce sixty impulses. Each ratchet in the steering motor has 200 teeth and

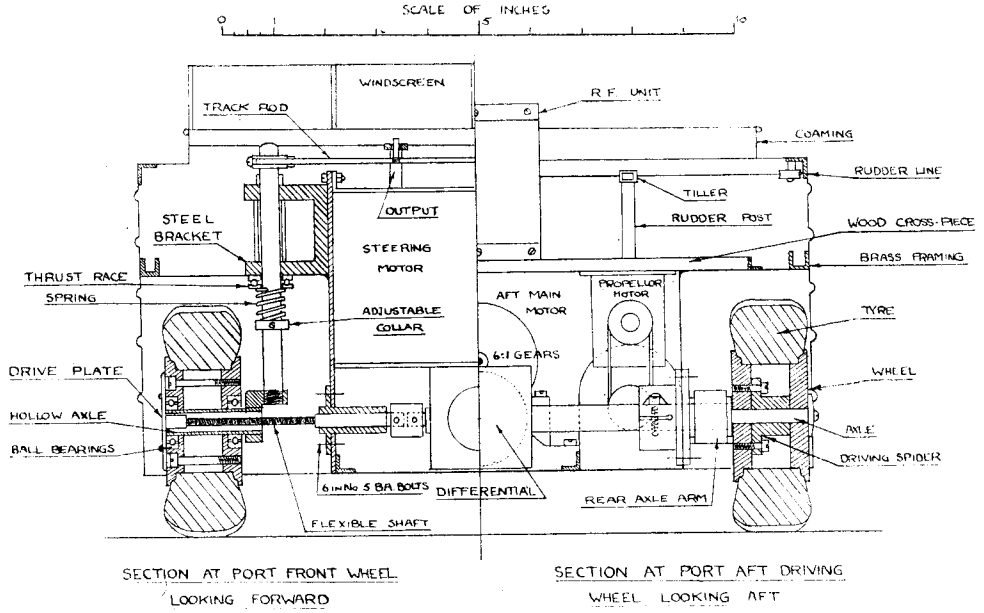


Fig. 3

steps one tooth per impulse. The gear reduction in the differential is two to one so that the 60 impulses produce a deflection of the front wheels of 54 deg., corresponding to full lock one side to full lock the other. The smallest movement of the wheels possible is 0.9 deg.

The pulsing device is driven from the wheel through a member carrying two micro-switches. The application of torque to the wheel depresses one or other of the switches and selects the signal appropriate to that direction of rotation. The signal is then sent out in pulses during the time that the wheel is being turned, since the torque necessary to turn the pulser is sufficient to keep the switch depressed. Each impulse operates the corresponding relay in the receiver, which in turn energises the approriate steering motor magnet.

In this way the steering wheels of the model are made to follow the movements of the control wheel, up to a rate of 30 steps, or 27 deg. of deflection, per second. Any attempt to move the wheel faster than this results in the control slipping, but it may be immediately regained by slowing down. At the lower rates of movement the control is completely positive, and any order made by the "driver" is responded to immediately by the model down to the limit of one impulse, which, as has been shown, results in a deflection of just under one degree of the front wheels. In practice this gives a fineness of control sufficient to execute any manoeuvre within the skill of the operator, as was so effectively demonstrated at the "Model Engineer" exhibition.

(*To be continued*)

Novices' Corner

(*Continued from page* 141)

out. For this purpose, as shown in the drawing, the two ends of the spring are unwound with a pair of round-nose pliers to increase the diameter of the coils and so cause them to grip in the bored holes. The spring is first pushed into the body while rotating it with the fingers so as to make the spring coil more closely; the plunger is then rotated in a similar manner and pushed on to the spring.

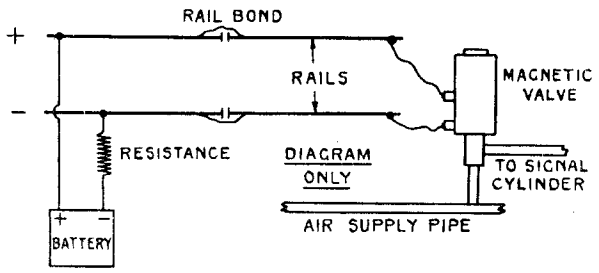
If the two ends of the spring have been sufficiently uncoiled in the first place, it will be found that the plunger is firmly held and can only be fully withdrawn with a twisting movement that closes the coils of the spring.

In the next article a description will be given of the method of using the centre-finder for centring various classes of work in the four-jaw chuck.

Lobby Chat—Automatic Signalling

by "L.B.S.C."

IT is a pretty safe bet that no builders of *Pamela* have yet finished making the valve gear parts which I described and illustrated a fortnight ago, and I haven't finished the next lot of notes and sketches for the *Tich* boiler; so let's have a break this week and spend a few minutes in the lobby. We shan't need to congregate around the stove in this weather, but the tea-bottle would be very welcome! Well, certain regular followers of these notes have, from time to time enquired whether I ever converted my old signal to automatic working. As a matter of fact, I did the job not very long ago, and it panned out O.K. In fact, I was so tickled with it, that I finished the job and signalled the line throughout, as a bit of a change from the never-ending writing, drawing and correspondence. It gave me a chance to spend a little time in the open air, and renew acquaintance with that all pervading but elusive personage, Milly Amp. It is wonderful what help she can give to an all-steam railway. I should imagine that my little railway is about the only one of its kind, that not only has automatic signalling, but a full-sized signal doing part of the needful!



Full-size track circuit

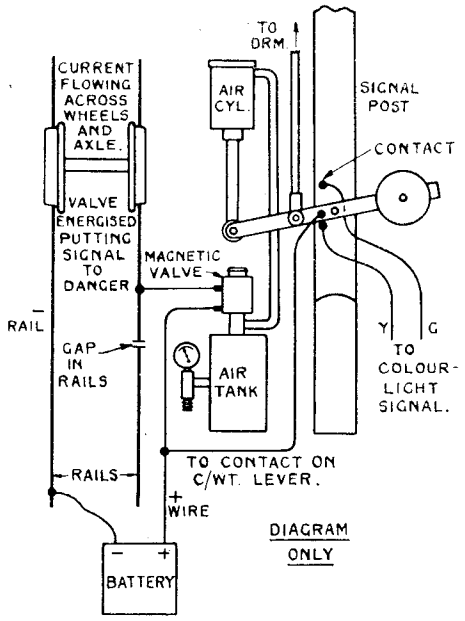
For new readers' benefit I might repeat that the full-size signal in question, did duty for some forty-five years at Coulsdon Station, being first installed by the London, Brighton and South Coast Railway, when the Quarry line, which enabled through trains to avoid Redhill Junction, was opened around the turn of the century. I passed it thousands of times; there was nothing to differentiate it from any other signals on the whole of the Brighton system, and it never entered my mind that one day in the future, the signal would be employed on a railway of my own. Still, it is curious how things work out; the old L.B. & S.C.R. lost its separate identity in the Southern, the signal engineer of the latter concern favoured upper-quadrant signals, erected where possible on posts made of old rails, and when in due course "Coulsdon No. 12" began to show signs of old age, it was replaced by one of the later pattern. I had previously made application to the Stores Superintendent of the S.R. for a discarded Brighton signal, for the sake of sentimentality; and when the signal inspector "tipped me off" that this one was in good condition, I was able to acquire it. A friend in the haulage line kindly brought it along from Coulsdon Station, complete with lamp, ladder, counterweight and all accessories; and two of the local permanent way gang (the only two left of the original gang who did the earthworks and planted the posts of my railway) erected the post for me. It is solid pitch-pine and it was some job getting it up. Except for about a foot or so at the bottom, which had gone spongy, the post was in excellent condition; a saw soon removed the defective part, and I shortened the ladder by a similar amount. The blobs and gadgets were soon replaced on the post, it was given a couple of coats of Mander's white paint, the ironwork, base, and lamp painted black, the arm repainted, and a picture of it in its new surroundings duly appeared on the cover of this journal.

From Moving to Fixed Wire

At Coulsdon, the signal was worked by a wire from the signal-box in the usual way, a 25-lb. counterweight being required to return it to the "on" position when the signalman released the lever. As we had neither signal-box nor wires, the signal was operated as required by moving the counterweight lever by hand; and to make it easy to work, I shifted the position of the counterweight, so that it barely balanced the arm and spectacle, these being of just sufficient weight to hold the arm in whichever position it was placed. Incidentally, a big crow got the shock of its life one morning when it tried to perch on the end of the arm. The signal promptly went to "clear" under the impact, and Mr. Crow "cleared" too, with great alacrity. It was my intention, right from the first, to make the signal work "all by itself" as the kiddies would say, so I schemed out a modification of the electro-pneumatic system first used on the "Underground," and wrote to Mr. O. S. Nock, to ask if he could obtain for me a used magnetic valve from his firm, the Westinghouse Brake and Signal Company. Mr. Nock promptly "came up to scratch" and in due course I met him at Paddington one afternoon, and collected the valve. This saved a great deal of work, as it was all ready to install.

The next requirements were an air cylinder and an air reservoir. For the former, I took the pump cylinder off a broken tyre foot-pump, and reconditioned it. A friend of bygone days gave me an air cylinder off a scrapped lorry which had been fitted with a straight air-brake. I had

plenty of used wire, old electrical fittings and so on, and all I then needed, was *time*. All things come to those who wait, says the old saw ; and in due course, the opportunity arose to do the job, as mentioned above.

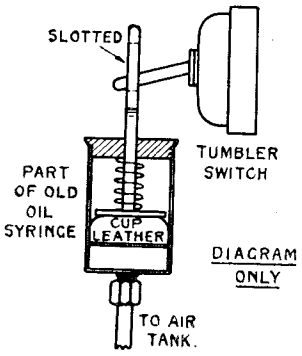


Apparatus on old L.B. &. S.C.R. signal

How It Works

The electro-pneumatic system as first used on the "Underground" is exceedingly simple ; and without going into technicalities, can be explained thus : There is a low-voltage current in the running rails, supplied by a battery, one rail being positive and the other negative. Each signal is operated by an air cylinder, supplied with compressed air from a lineside pipe. The air is controlled by a magnetic valve, as mentioned above, the magnet being connected across the running rails. All the time the section is clear, with no train on it, the current from the running rails energises the magnet, and holds the valve open, allowing air to pass from the supply pipe to the cylinder, the piston and rod of which acts on the counterweight lever and holds the signal in the "clear" position. As soon as a train passes the signal, the rails are short-circuited by the wheels and axles ; the magnetic valve "goes dead," and a spring closes the air valve and opens a release valve, letting the air out of the cylinder. The counterweight then puts the signal to danger, where it remains until the train clears the section. The flow of "juice" is then resumed through the magnetic valve, which opens the air valve, admits air to the cylinder, and puts the signal to "all clear" once more. There are, of course, various accessories such as resistances across the main circuit to prevent the trains directly "shorting" the batteries ; relays and connections for the "distant" or "repeater" signals, and so on, but we needn't bother about them here. It will be seen that the system is perfectly safe, because a current failure allows all the magnetic valves to go dead, and thus put all the signals to danger ; the worst that can happen is nothing more serious than delay to the trains.

In my installation I reversed the whole business, for two reasons : economy of current and air, also simplicity of wiring. All I needed, was for the signals to go "on" after a train had passed, and come "off" again when the section was clear ; the automatic safety factor was not needed, so I used a "one-wire" system, same as on a motor-car equipment. Instead of using the chassis for a common "earth" or negative return, I use the inner rail. The power station is a 12-volt car battery on a bench in my car shed, which is within a yard or so of the line at one point on the north curve. The wires go from the battery to a little switchboard on the wall, containing a double-pole main switch, a charge-and-discharge ammeter, and a charging plug ; the latter allows the battery to be boosted up as required, from the charger which I have for emergency use in case the batteries on the gasoline cart need any help, which they haven't done so far in normal circumstances, though I give them a liven-up before using the starter on a cold morning. From the switchboard, the wires go under the garage wall, through a shallow trough in the concrete path, filled up with cement, and up one of the concrete posts, where the negative wire is directly connected to the inner rail. The positive branches into two here, one going to the big signal, and the other to a three-aspect colour-light signal, which I will deal with presently. This part of the wiring



Improvised pressure-operated switch

is in lead-covered cable, of which I had a fair supply, used, but in good condition, given to me by a friend, now, alas ! passed on.

The Signal Equipment

The air reservoir is clipped to the base of the signal post a few inches above ground, and the magnetic valve is on top of it, attached by a short piece of $\frac{1}{2}$-in. galvanised pipe with union. The ex-tyre-pump-air-cylinder is hung from a forked

bracket just above the end of the counterweight lever on the signal post, the " big-end " on the piston-rod being directly connected to a pin in the lever, the upper end of the cylinder being free to oscillate slightly in the bracket. It is connected direct to the outlet of the magnetic valve by a short piece of the pump hose. One of the two terminals on the valve is connected to the positive wire mentioned above, which comes from the garage under the longitudinals, and is completely out of sight ; the other is connected to the outer running rail, the cable going down under the turf, and up one of the concrete posts, to both junction points. A small brass tee is screwed into the air reservoir, the upper end carrying a pressure-gauge reading to 25 lb. and the other carrying a check-valve just like the one described for *Tich's* oil pipe, only larger, with 7/32-in. ball.

The air supply is provided by the ¼-h.p. motor and small compressor that I used for steam raising before Mr. Barltrop gave me the little fan. For current to operate the motor, I fitted an extension cable from the blower plug on the water-tank stand, to the signal post, terminating in a waterproof plug. The motor takes its current from this, *via* a pressure-operated switch made from a piece of an old syringe with a cup-leather piston. The piston-rod acts on the knob of an ordinary tumbler switch, the whole being enclosed in a waterproof casing. When pressure rises to 25 lb. the piston-rod pushes up the switch knob and cuts off the juice. When it falls to 15 lb., the spring above the piston pushes it down, pulls down the switch knob, and away she goes again. The motor compressor remains portable, for two reasons ; first, I didn't want to leave it out in bad weather, and secondly, I use it to pump up the car tyres. At my time of life it is a bit fatiguing to pump tyres by hand, especially after changing a tube or cover. The hose from the pump is attached to the check-valve on the air tank, exactly the same as on the tyre, by an instantaneous lever-operated connection of the type usually fitted to tyre-pumps.

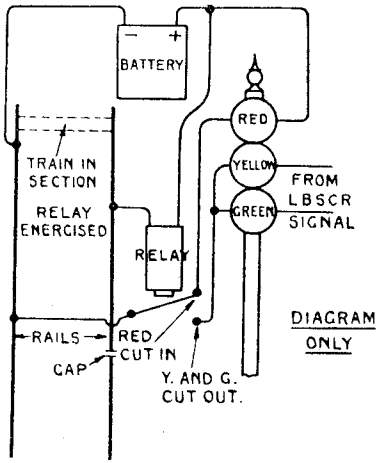
The action is as follows : the line is normally dead, the magnetic valve is de-energised, and the air cylinder in direct communication with the atmosphere *via* the piece of pump hose and the outlet of the magnetic valve. The signal arm is kept " off " by the counterweight, which is attached to its lever in a position exactly opposite to that which it occupied in Coulsdon days. As soon as a train passes the joint in the rails just past the signal, the wheels and axles act as a switch, closing the circuit to the negative rail, current then flowing from the positive wire, through the magnetic valve, to the outer rail, through wheels and axles to the inner rail. The magnetic valve then opens and admits air to the cylinder, the piston of which pushes down the end of the counterweight lever, and puts the arm to danger with a clang reminiscent of manually-operated Coulsdon days, when the signalman had just come on duty, refreshed by a drop of Bass or Guinness in the days when beer *was* beer, and felt extra energetic. The outer rail being bonded with bits of bell-wire, attached to the rail webs by 3/32-in. brass screws, right around the south curve, the signal remains " on " until the train reaches the east side straight line. As soon as it passes the last bonded rail, the circuit is broken, as there is nothing to connect the two rails ; the magnetic valve goes dead, releases the air in the cylinder, and the signal arm clears. I'd bet my last copper that if I told the old Coulsdon signalman, that " No. 12 " could be worked by an old tyre pump, and 15 lb. of air pressure, he would recollect the mighty heaves he gave at the lever, call me a you-know-what, and go and have a Mann-and-Crossman to soothe his feelings !

Colour-light Signal

Now if you are looking straight ahead, in the manner usually observed among good engine-drivers, you don't spot old No. 12 until you leave the north curve ; and if we had two engines at work at the same time, and one had stopped for water or any other purpose, it would mean an emergency stop at the signal, or maybe even a collision. I reckoned we needed a " distant," so by way of variety, decided to install a modern colour-light signal at the beginning of the north curve, showing yellow if the stop signal was " on," and green when " off." This was a " piece of cake." Many years ago, before " trafficators " (side direction indicators) were used on cars, the Morris people brought out a right-or-left turn indicator like a miniature three-aspect colour-light signal. It needed a good memory to know what indication was given, and even if the motorist remembered it, other road users were ignorant of the actual meaning of the light combinations, so the idea was abandoned and the little colour-lights sold off as scrap for a few pence apiece. I acquired half-a-dozen of them, and used one on this job. One side, with its three glasses, was taken off, and a flat aluminium plate screwed to the case in place of this, leaving the other side intact with its three coloured lenses (red, yellow and green) and the visors over them. This gadget was attached to a piece of galvanised pipe, with a ball-and-spike finial (turned from aluminium rod) on top, and a waterproof junction-box at the bottom. A length of the same pipe was driven deep into the ground, at the entrance to the north curve, and the bottom lug of the junction-box screwed on to it. The wires ran down inside the pipe, to the junction-box, from the three festoon lamps inside the casing behind the coloured glasses.

The working was arranged very simply. A small piece of ebonite tube (casing of a broken radio condenser) was attached to the counterweight lever of the Coulsdon signal ; this had a copper ring on the end, attached by a piece of sparking-plug cable to the same terminal of the magnetic valve which carried the positive wire from the battery. Two contacts made of bronze strip, were attached to the signal-post in such a position that the copper ring made contact with them in the up-and-down positions of the counterweight lever. From these contacts, two wires were taken under the longitudinals of the railway to the colour-light signal, and attached to the wires going to the yellow and green lights respectively ; the common return wire was taken to the negative or inside rail. Therefore, when the Coulsdon signal was at danger, the juice ran from the positive wire, *via* the ring, contact, and connecting wire, to the yellow light ; when

it cleared, the ring touched the other contact, and lit up the green. This was fine ; running in the twilight, or in darkness, the colours fairly blazed at the driver, just as in full size. Like Oliver Twist, however, I longed for more, and decided to add another section and utilise the red light as well.



Connections of three-aspect colour-light signal

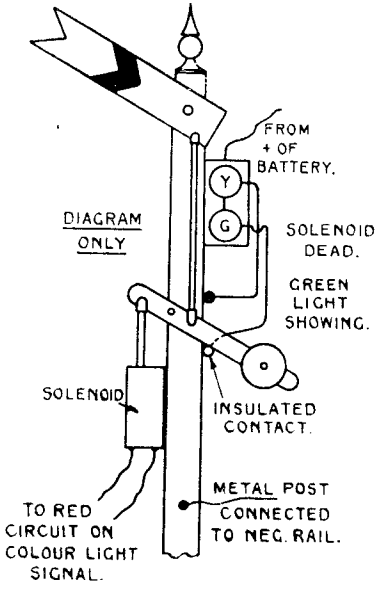
Viaduct Section

The next stage of the proceedings was to bond up the outside rail from the first joint past the colour-light signal, to the last one before the Coulsdon signal, forming the No. 2 or viaduct section ; and the other branch of the positive wire from the battery, mentioned at the beginning of our chinwag, was connected *via* the junction-box to the lamp behind the red glass, the return wire coming by the same route, and a separate terminal, to the outer rail. When a train passed the colour-light, the red now lit up, current running from positive, through lamp and return wire to the outer rail, thence *via* wheels and axles to the negative or inner rail ; but the yellow or green, repeating the Coulsdon signal, still remained alight, which was, of course, " all wrong." When you have an ordinary semaphore " distant " on the same post as a stop signal, the arms are interconnected so that the " distant " can only be off when the stop signal is also off ; and the same ruling applies to the colour-lights, as the red should " put the others out." This discrepancy was easily cured by adding a relay switch in a box under the longitudinals. One pole on the relay magnet wire was connected to the positive wire going to the red light, and the other to the outer rail. The return wires from the lights, were disconnected from the outer rail, and connected to two contacts of the relay switch, the other two contacts being connected to the inner rail.

The armature of relay magnet, when de-energised, was normally down, and the lower contact in engagement ; as this was connected to the return wires from the yellow and green lights, it follows that when the section was unoccupied, one or other of these lights would be showing, repeating the position of the Coulsdon signal. As soon as the train passed the signal and entered the section, the wheels and axles completed the relay circuit. Up went the magnet armature, breaking the return circuit of the green and yellow lights, and making the red light circuit complete through the upper relay switch ; so out went the green or yellow, and in came the red, which remained alight until the train arrived at the Coulsdon signal and ran out of the section. We were getting on !

The Curly Patent Combination Signal

The colour-light signal being right at the end of the east side straight run, and showing powerful lights, it was visible plenty soon enough to stop, even from high speed, if it showed red ; but all the same, I reckoned it ought to have a " distant," so I made one, and broke away from tradition in doing so. As most readers know, although I only have a few personal friends left, thanks to the Great Reaper, I have many correspondent friends who are drivers in active service, and the desire has often been expressed for a combined colour-light and semaphore signal.



How the distant signal works

They say the lights are grand at night, or in dull weather, but they would rather have a semaphore in bright daylight, especially when the sun is bright. I therefore combined the two in one signal. Another of the ex-Morris colour-lights was " blank-backed," and attached to a similar post to the signal mentioned above, only not so near the top. Just above it, a semaphore arm cut from a bit of 20-gauge rustless sheet steel (loud cheers from friend Austen-Walton) was pivoted on a rustless steel bolt (renewed applause!) Just below the light, I fixed a lever and counter-

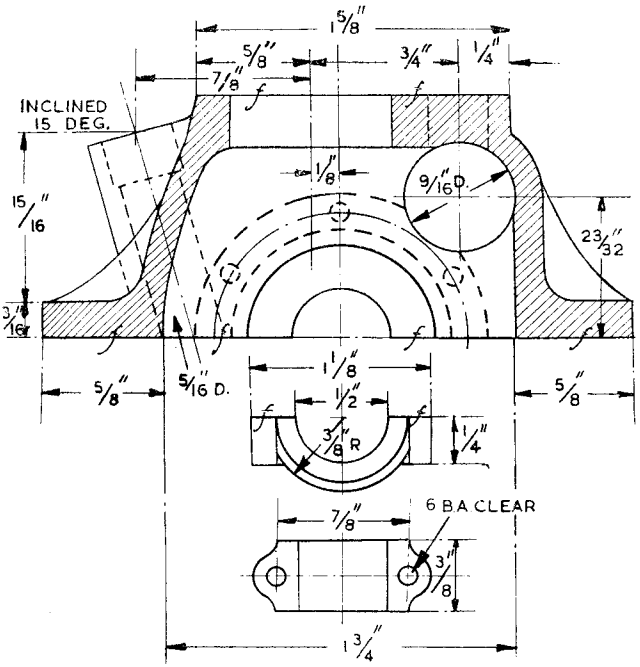
(*Continued on page* 154)

PETROL ENGINE TOPICS

*A 10 c.c. Twin Four-Stroke

by Edgar T. Westbury

THE castings for the main engine components, including the cylinders, cylinder-heads, jacket covers, crankcase, sump, timing cover and bearing housings, are designed to be sand-cast in a good quality aluminium alloy, and all machining operations are arranged to be as straightforward as possible. Like the " Seal " engine, this design gives a good deal of scope for minor modification or adaptability in the arrangement of the engine to suit individual choice of convenience; the crankcase may be disposed either way round, the positions of timing gear and flywheel being interchangeable to produce either a " right-hand " or a " left-hand " arrangement, each being a mirror image of the other. The only castings which would have to be actually altered, that is, made right- or left-handed in such cases, are the timing case and timing housing.



Sectional end view of crankcase, showing details of centre bearing cap

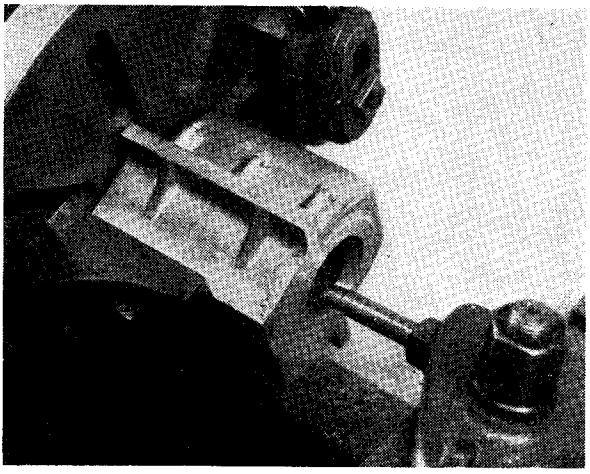
Crankcase and Sump

These are dealt with together, as most of the machining operations are carried out with the two parts assembled as a single unit. Having checked over the dimensions of the castings to get an idea of the amount of metal to be removed from the machined surfaces—marking-out, in the usual sense of the term, is not necessary—the first operation on each part is the facing of the joint surfaces on the plane of the shaft centre-line. This may be carried out by holding each casting in turn across the jaws of the four-jaw chuck. Centring is unimportant, but the general truth of the face should be carefully checked in each case. It will be found that the upper component can be gripped quite easily in the reversed jaws of the four-jaw chuck, as all four of the jaws can take a firm bearing on the ends and sides of the casting; but in the case of the sump, the sides are rounded off and provide no secure bearing for the jaws. However, by gripping firmly on the end faces, and setting the jaws lightly up against the sides, so that they act merely as a safeguard against tilting, the casting can be held quite firmly enough for the light facing operation. The surfaces on both parts should be machined to finished dimensions, and care taken to ensure as good a finish as possible.

Next the upper component should be machined on the top surface, by clamping it to the faceplate with one or more toe clamps on each of the side feet, and a sheet of thin paper under the joint surface to protect it from damage and improve to grip. The top surface may be finished to specified dimensions if desired, checking from the faceplate with a depth gauge, but some constructors may prefer to leave this dimension oversize at the present stage, as it may be more convenient to have some allowance for adjustment in the assembly of the working components.

The holes for the screws which secure the sump to the crankcase may now be drilled and tapped for temporary screws to hold the parts together for subsequent operations. Before assembling them, however, a careful check of the truth of the joint surfaces should be made using marking colour on the surface plate, or

*Continued from page 51, " M.E.," July 13, 1950.



First boring and facing operation on crankcase-sump assembly, while mounted on angle-plate

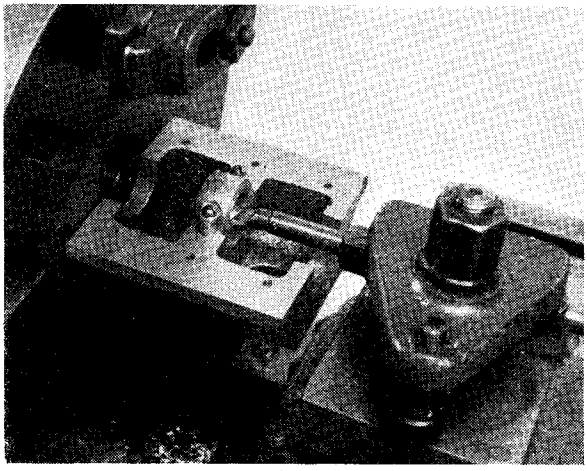
on a piece of thick plate glass ; it may be found desirable to lap the faces in order to assure beyond doubt that when bolted together they will make contact all over the joint surface and produce an oil tight joint without the need to use jointing material. The latter is not prohibited, but if it is to be used at all, it should be fitted at the present stage of proceedings, so that its thickness is duly allowed for in machining the housing registers. On the whole, it is better to avoid the need for packing of any kind here.

Centre Bearing Cap

Before proceeding further with the machining of the crankcase assembly, this minor component should be machined on the joint face, and attached in its proper position on the under face of the crankcase, by temporary screws. It may be held across the jaws of the four-jaw chuck for the facing operation, and no attempt should be made to face the sides of the casting or carry out any other operations on it, except boring and spot facing the screw holes, before mounting it in position on the main casting. The sump is then placed in position and secured by its six screws.

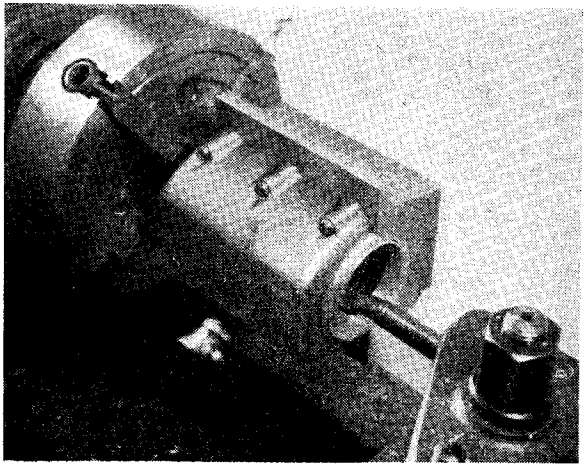
In the next operation, the assembly is set up on an angle-plate, with the top surface of the crankcase as the bolting face, for machining the housings. It is important, for reasons which will be apparent later, that the work should be held in such a way that it is possible to remove the sump without disturbing the setting of the crankcase on the angle-plate. In the example illustrated, only a small angle-plate was available, which did not allow of fitting clamps to bear on the side feet of the casting ; the only convenient means of clamping the assembly to the angle-plate was by means of a single bolt, passing through one of the cored cylinder seating bores, with a small plate on the inside to ensure a firm bearing. As the machining operations are fairly light, the single bolt was sufficient to hold it firmly, but if a deeper angle-plate had been available, it would be prudent to use a bolt through each of the bores for extra security.

The work was secured to the angle-plate (not forgetting the piece of paper under the face) before mounting the latter on the face-plate, after which the sides of the

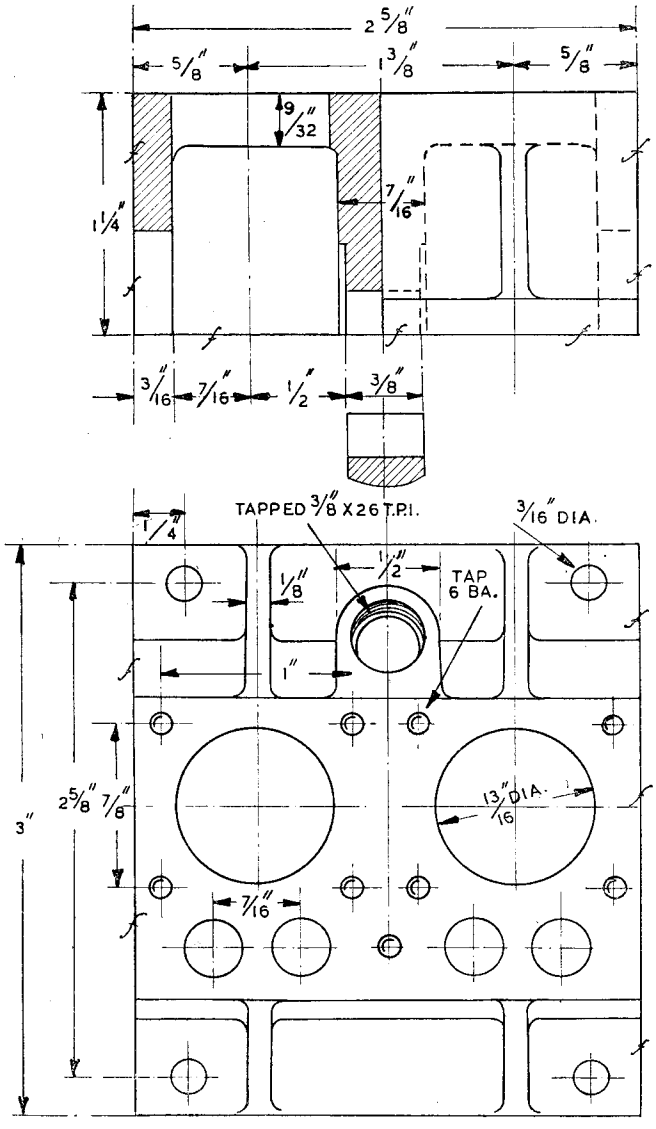


Boring and facing centre bearing, with sump removed for accessibility

Below — Second operation on crankcase - sump assembly while mounted on stub mandrel



crankcase feet were set square with the faceplate, and the angle-plate shifted to centre the bore of the main bearing housing, also checking up on the truth of the centre bearing housing, preliminary to boring it to finished diameter and facing the end. It will be noted that the facing cut is taken right across the end surface of the crankcase, as this forms a bolting face for the attachment of the timing housing at one end, and a seating for the camshaft bush at the other.



Sectional elevation and plan of crankcase

Having dealt with the outer bearing housing, the centre bearing housing may now be bored and forced on the accessible side. It is possible to carry out this work with the sump in position, but for convenience and good visibility, the removal of the sump is recommended, so long as it can be done without disturbing the set-up of the crankcase. It was necessary to use a rather small boring tool in the bore of the housing, and this was not stiff enough to carry out the facing operations as well, but this was done with the boring tool which had previously been employed for the bore of the outer housing. The locating of this face can be checked by a depth gauge from the outer face.

If desired, it would be possible to face the other side of the centre housing at this setting, by using a suitable internal tool, but there is no special advantage in doing so, as it can be done so much easier at a later setting.

Before removing the work from the angle-plate, the sump should be replaced, and great care taken to see that when it is secured in position, the machined face of the housing is properly located, exactly flush with the face of the crankcase, also that the bore coincides, as any discrepancy in either respect will affect the accuracy of operations from the other end of the assembly.

A piece of metal large enough to machine up to 1⅛ in. diameter is now held in the four-jaw chuck and turned to a light press fit in the bore of the main bearing housing which has been machined. This piece should be long enough to turn down so as to form a spigot to locate in the bore of the centre bearing housing, but other than this, should be kept as short as possible, so that when the work is mounted on it, no greater overhang from the chuck than is absolutely necessary is allowed. The reverse end bearing housing may now be bored and faced, and the centre housing also faced, with the assurance that the three bearings will all be in perfect axial alignment.

Cylinder Seatings

Before removing the assembly from the stub mandrel, it is advisable to mark out the vertical centre line of the crankcase, in order to locate the centre lines for the cylinder and valve tappet seatings. This may be done by using a scribing block on the lathe bed or cross-slide, with the scriber point set exactly to centre height. The dividing line of the crankcase and sump is set vertically, by sighting against the blade of a

square placed on the lathe bed, and the centre line scribed on the face of the crankcase, and across the top surface.

The cylinder centre is $\frac{1}{8}$ in. offset or desaxé, and it is advisable to plug the cored holes with hardwood or soft metal bungs in order to enable the centre lines to be marked out. At the same time the centres for the tappets can be marked, $\frac{5}{8}$ in. to the other side of the shaft centre line, centre-punched and outlined by scribed circles. To bore the cylinder seatings, the crankcase is again set up on the faceplate, and each of the centres set to run truly in turn. In order to ensure that the cylinder centres are truly aligned, it is a good policy to clamp a locating strip on one or both sides of the crankcase, but before doing so, it should be ascertained that the edges of the feet are straight, and parallel with the shaft centre.

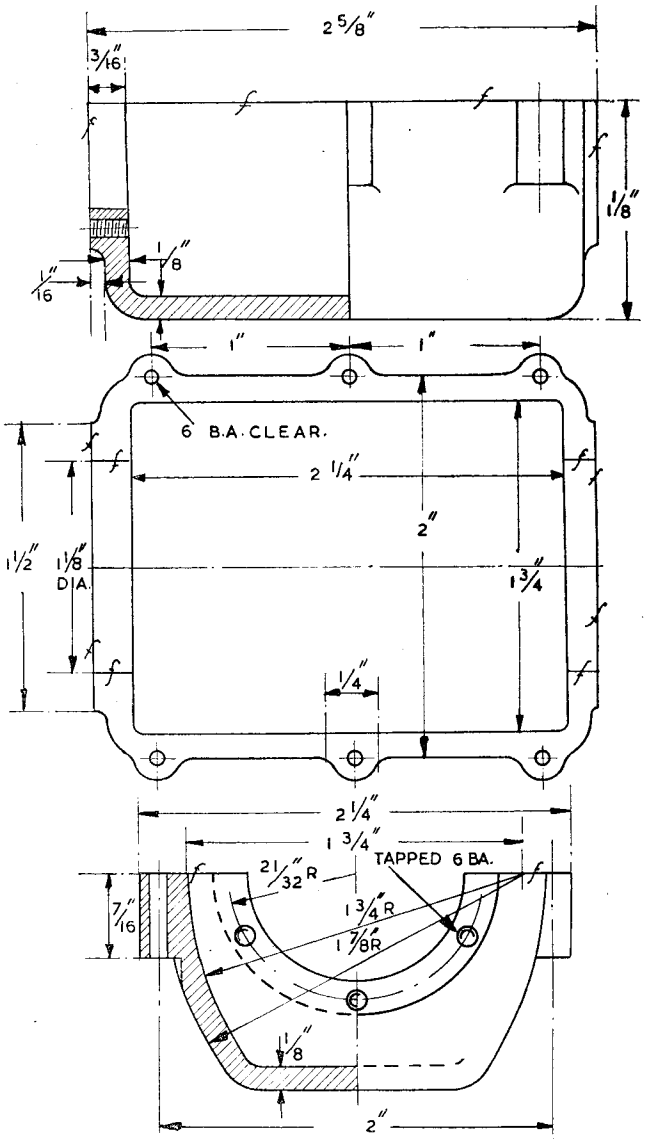
Tappet Seatings

Although it would be quite practicable to drill these in a reasonably accurate drilling machine, it is well worth while taking a little extra trouble to set them up in the same way, while still on the faceplate. These holes cannot be reamed with an ordinary reamer, as it would not enter far enough to produce a parallel hole, but a D-bit may be used with advantage. It may be mentioned that the tappets work directly in the aluminium casting, and this has been found quite satisfactory, but some constructors may prefer to bush the seatings with bronze sleeves in order to improve the wearing qualities, and there is plenty of metal around the holes to enable this to be done. Under normal working conditions, the tappets are well lubricated—sometimes almost too well, in fact—and any wear in the seatings is shown by oil leakage around the tappets.

Camshaft Tunnel

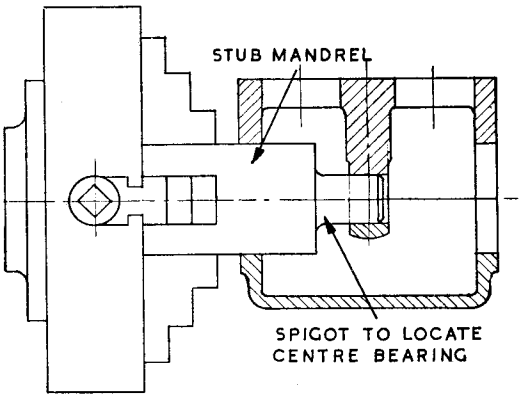
The position of this is marked out from the shaft centre line on the face of the crankcase, also from the horizontal dividing line. It may be mentioned that the location of this shaft centre is not critical, as it does not directly affect the meshing of the timing gears, which is capable of adjustment by slight shifting of the idler gear centre; but the measurements should be as accurate as possible. For boring the tunnel through the end walls and centre partition of the crankcase, the latter should be mounted on an angle-plate, taking care that the shaft centre line, as marked on the top surface, is parallel with the lathe axis; this may be checked by a square from the face of the faceplate.

The camshaft centre is then set to run truly by shifting the angle-plate, and after centre-drilling, the hole is drilled well undersize—not more than $\frac{7}{16}$ in. diameter—and opened out with a boring tool. It is quite probable that after the drill has passed through the end wall, it will show signs of wobbling when it enters the centre partition; to check this tendency, it



Sectional end and side elevations, and plan of sump

is advisable to bore out the hole in the wall to a tight fit for the next size of drill, so that it will act as a close-fitting jig bush for the latter, and by proceeding cautiously, true drilling may be ensured. One should never assume that because a hole is to be bored out, wobbling of the drill does not matter, because when once it starts, it gets worse as it goes on, and its extent can neither be measured nor controlled. A $\frac{9}{16}$ in. reamer may be used to finish the bore of the tunnel.



Method of setting crankcase-sump assembly on stub mandrel for "second operation" machining after reversal

Breather Orifice

The crankcase may be mounted on an adjustable angle-plate, or on a wedge-shaped wood packing block, for drilling this hole, preferably in the lathe, though if care is used, the drilling machine is permissible. Neither the exact angle nor the location of this hole is of critical importance. A $\frac{5}{16}$ in. hole is run right through, to emerge at the edge of the centre partition; it is counterbored and tapped $\frac{3}{8}$ in. × 26 t.p.i. for a depth of $\frac{1}{4}$ in., and the top surface should be spot faced so as to provide a really true and oil-tight seating for the breather pipe.

(*To be continued*)

"L.B.S.C."

(*Continued from page* 149)

weight, connecting same to the arm by a piece of drawn bronze rod with a brass fork at each end. This lever carried a weeny edition of the two contacts attached to the counterweight lever of the Coulsdon signal, the contacts being connected to the yellow and green lights. The semaphore arm "goes up for down" as the kiddies say, being upper-quadrant, as I thought I might as well have the whole variety whilst on the job!

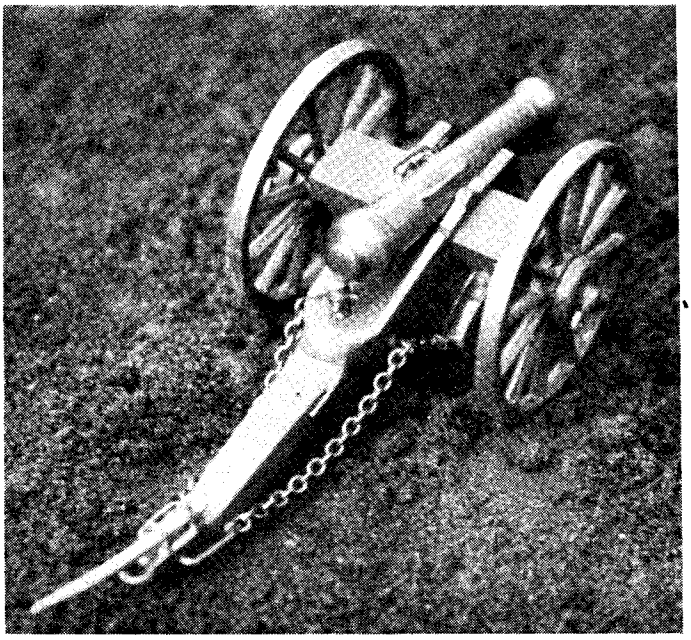
The counterweight, as on the Coulsdon signal, holds the arm normally in the "clear" position. Just below the lever, I fixed a solenoid out of a car "trafficator"; the plunger of this is connected to the end of the counterweight lever by another bronze rod with fork ends. The two wires from the solenoid coil are taken along to the colour-light signal, under the longitudinals of the railway, and connected in parallel with the red light; so that when the red lights up, current also travels to the solenoid, pulls down the plunger and puts the distant signal to caution. The contacts on the little counterweight lever, light up either the yellow or green, according to whether the signal is "on" or "off"; current is taken to the two lamps *via* a wire connected to the main positive wire, and the return goes through the counterweight lever and the metal of the post, which is connected to the negative or inner rail. This signal is located at the end of the south curve. As it is only to repeat the indication given by the stop signal farther on, nothing happens when a train passes it, same as when a full-size train passes a "distant" at caution or clear.

On a recent Saturday afternoon, three friends came up from Ashford, and the line was in operation for nearly four hours, during which time everything worked perfectly. The combination signal had not been put in then, as it was not quite ready, but it operated from a temporary connection when tested. The self-acting semaphore on the Coulsdon signal has puzzled the few local children who sometimes come up to see if the little line is working; they think the signalman in the box on the bank opposite, is working it. We have only had one failure; prolonged rain wetted the sleepers to such an extent, that enough current leaked across to hold the magnetic valve open, and keep the signal at danger. It reminded me of an incident in the early days of the Bakerloo tube, when a linesman, discharged for a breach of company regulations, shorted the rails between Oxford Circus and Regents Park with a bit of bell-wire hidden under the ballast, and put all the signals in the section to danger. It was three days before it was found—naturally, the signal dept. looked everywhere else for faults before they eventually discovered the wire!

A Model Cannon

by

Lieut. T. S. Penny

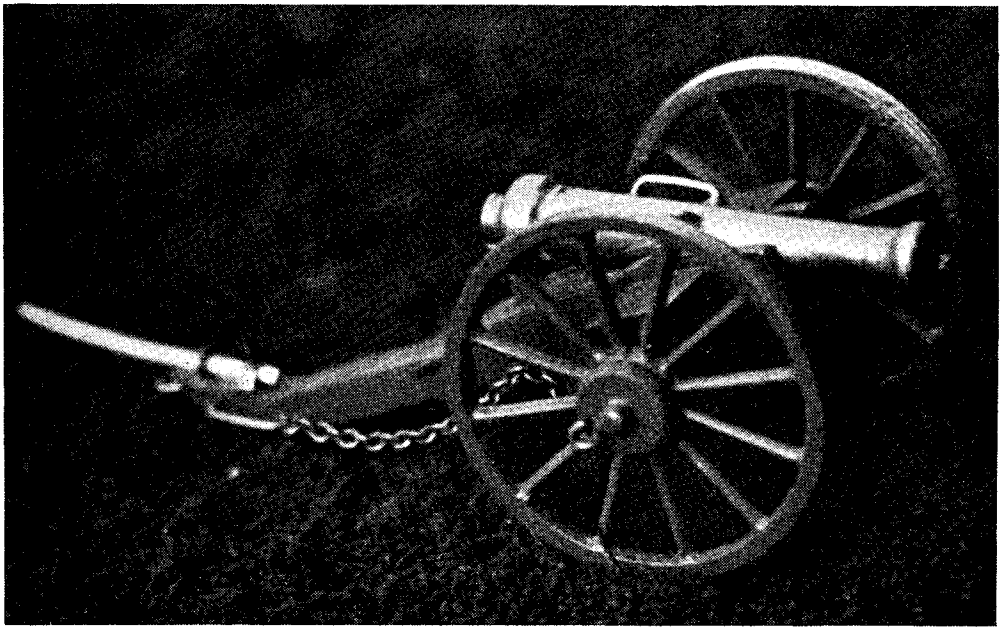


THE two photographs reproduced on this page show a model of a 9-pounder cannon as used in the latter part of the Battle of Waterloo.

These cannon were used by the Royal Horse Artillery and, with such great success, that it is said the battle would have been lost without them.

The model is only 8 in. long and is made to fire powder and shot. All the woodwork is in mahogany with brass trappings. The barrel is turned up from solid brass with a bore of $\frac{1}{4}$ in. I was lucky in obtaining a mould for the wheels which I cast in lead. The elevation gear operates and the turnpike can be taken out to allow the cannon to be hooked on to the limber.

The model is the first of twenty I am making for Major Young, D.S.O., M.C., the well-known collector of period soldiers.



IN THE WORKSHOP

by "Duplex"

No. 68—Making the Kennedy Bending Machine

THE bending machine designed by Messrs. W. Kennedy Ltd., of West Drayton, Middx., has been produced in kit form to enable amateurs to build for themselves a tool which will bend a wide range of metal sections.

The machine is particularly suitable for tube work, and, in Fig. 1, is seen set up for bending ½ in. diameter tubing. The tool, however, will also handle flat mild-steel on edge, T-section material, angle brass and many other sections that would otherwise be beyond the bending capacity of the amateur.

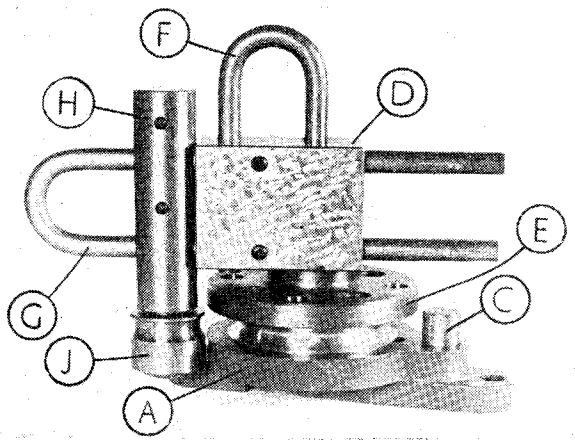


Fig. 1. The machine set up for bending ½ in. tubing

As will be seen from the illustration, the machine consists of a base *A* into which is pressed a screwed mandrel *B* seen in Fig. 2. The base is provided with a movable stop *C* against which the work rests during the bending process. The mandrel carries a bending head *D* and a top-plate *E*, the latter being used for holding the work down against the base. It will be seen from the illustration that the top-plate *E* has a number of recesses cast in its upper surface. These are to receive the U-shaped plunger *F* mounted in the bending head *D*, and to allow the top-plate to be turned when pulling on the operating lever *G* which, in a modification to the original design, is made so that it can push through the bending head *D* to enable the machine to be packed into a small space. This modification greatly simplifies the machining of the sliding stud *H*, as will be seen later. Mounted upon this stud is the bending roller *J* which is reversible to allow either round or flat section material to be bent. Here, again, a small modification has been introduced; instead of the ⅛ in. split pin which was originally intended to keep the roller in place a knurled screw *K*, which may be seen in Fig. 3, has been substituted.

Reverting for the moment to the screwed mandrel *B* seen in Fig. 2 it will be observed that the screwed portion terminates against a collar, which is made of case-hardened mild steel. This collar is slipped over the mandrel before it is pressed into the base, and is used as a former when bending flat material on edge. Formers used for other purposes, as will be seen from the illustrations, are slipped over the screwed portion of the mandrel.

In the past there has been a slight discrepancy in the manufacturers' drawings, which has resulted in the plunger *F* failing to register with the cast-in recesses in the top-plate *E*.

As will be seen from the illustrations, this error has necessitated the machining of a new set of recesses. It is understood from the makers, however, that this matter has received attention and that the drawings have been corrected, so that those now issued with the sets of material are accurate in this and all other respects.

Making the Kennedy Bender

The kit supplied included everything necessary for making the machine, together with an Allen key for use with the cap screws which serve to clamp the sliding stud to the operating lever. Also supplied ready made are the plunger *F* and the operating lever *G*. The castings, which are of iron, are clean and machine to a good finish. The steel supplied is not the most free-cutting obtainable, nevertheless it machines readily enough, and a good finish can be obtained, particularly if soap-and-water is used as a lubricant. This is especially the case when cutting the 1-in. B.S.F. thread on the screwed mandrel. Lard or mineral oils, whilst they enable the material to be turned readily, do not assist in producing a good finish and are particularly troublesome in the screw-cutting operation.

Before any machining is undertaken, it will be well to examine all the material, as well as the castings provided, and to remove any burrs or blemishes there may be. Where necessary, the castings should be cleaned up with an old file, so as to form a good surface for the painting, which is carried out at a later stage. The castings may

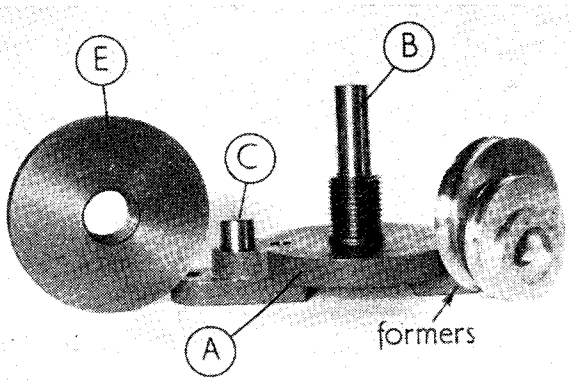


Fig. 2. Base of the machine, showing mandrel, top plate and bending formers

also, with advantage, be pickled in a weak solution of hydrochloric acid. This helps to remove any sand that may be adhering to the surface. After pickling, the parts must be well washed in hot water, and a beginning may then be made by machining the base *A*.

Machining the Base "A"

Operation 1. The base *A* is gripped in the 4-jaw independent chuck for machining the underside of the foot. A right-hand knife tool is mounted in the top-slide for this purpose, and it is advisable to use a tungsten carbide tipped tool as it may be found that the outer ends of the base are chilled and too hard to machine with ordinary steel tools. No dimension is given in the drawings for the thickness of the foot, but it is only necessary to remove enough metal to ensure that the surface will make proper abutment against the lathe faceplate which is used for the second operation on the base. After the foot has been machined, the central boss must be faced. Enough metal must be removed here to ensure that, when the top of the base has been machined, the $\frac{9}{16}$ in. dimension called for in the drawing is maintained without unduly reducing the thickness of the table portion.

Operation 2. The casting is now removed from the 4-jaw chuck, and bolted to the lathe faceplate, by means of bolts passing through holes in the foot of the casting, to enable the top surface to be machined. This operation is again performed with the tungsten carbide knife tool mounted in the top-slide, and the machining is carried out until the distance from the surface to the underside of the central boss measures $\frac{9}{16}$ in.

After this part of the work has been completed, it will be found convenient before boring the $\frac{5}{8}$-in. hole for the screwed mandrel, to mark off a centre line on the top surface of the base whilst the casting is still bolted to the faceplate. This line will subsequently be required in connection with the two $\frac{3}{8}$ in. dia. holes formed to receive the stop. Accordingly, the machined surface is painted with marking fluid, and the centre of the projecting portion of the base, in which the $\frac{3}{8}$ in. holes are located, is determined with a pair of hermaphrodite calipers. The knife tool, which has, of course, been set previously to a lathe centre height, is now turned in the toolpost to allow its point to make contact with the work. The scribed centre line on the projecting portion of the base is now aligned with the tool point, and the tool, in contact with the work, is fed across to produce the required centre line.

Operation 3. The knife tool is now changed for a boring tool and the work is then centre-drilled, pilot drilled and finally drilled to $\frac{1}{2}$ in. dia. before boring to $\frac{5}{8}$ in. dia.

Operation 4. The work is now removed from the faceplate and the centres for the two $\frac{3}{8}$-in. holes to receive the stop *C* are marked off on the centre line previously struck in Operation 2. Hermaphrodite calipers will serve for this purpose, the first centre being drawn $1\frac{1}{16}$ in. from the edge of the $\frac{5}{8}$-in. dia. hole and the second centre marked off $\frac{3}{4}$ in. from the first.

Operation 5. The casting is now removed to the drilling machine, and the two holes are first centre drilled, then pilot drilled and finally drilled with a letter size U drill or, if available, a drill 9.4 mm. dia., for reaming to $\frac{3}{8}$ in. dia. It should, however, be noted that the millimeter drill size quoted is one that is regularly in stock. Its decimal equivalent is 0.3701 in., thus leaving only some 0.004 in. of metal to be removed by the reamer, instead of 0.007 in. when letter U drill is used. The next larger size stock drill is 9.5 mm., but as this drill leaves only 0.001 in. of metal for reaming this would not be a sufficient allowance in the event of the drill cutting oversize. The reaming operation can be carried out in the drilling machine when run at a very slow speed. If the reaming operation is performed by

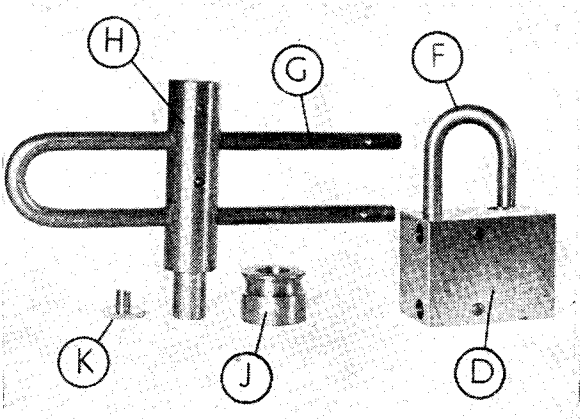


Fig. 3. The bending head with plunger, the operating lever with sliding stud and bending roller

hand, the reamer must be fed in slowly, to ensure that the holes remain square with the surface of the base.

The machining of the base is now complete, and the making of the screwed mandrel *B* may now be undertaken.

Machining the Screwed Mandrel "B"

Operation 1. The piece of mild steel supplied for making the screwed mandrel to the dimensions seen in Fig. 5 is first set to run truly in the 4-jaw chuck with $4\frac{1}{2}$ in. of material projecting. The work is then centre-drilled so that it can be supported by the back centre and the $\frac{5}{8}$-in. dia. spigot is turned, with a right-hand knife tool mounted in the top-slide, to a length of $\frac{11}{16}$ in. As the mandrel must be a press fit in the base *A*, the actual diameter of the spigot should be made 0.001 in. larger than the corresponding $\frac{5}{8}$-in. bore in the base. This degree of interference will be found to give a satisfactory fit between the two parts in question.

Operation 2. The 1-in. dia. B.S.F. thread has now to be machined, but first the $1\frac{5}{8}$ in. × $\frac{3}{8}$ in. dia. portion of the mandrel must be rough machined to allow the screw-cutting tool to clear when it has passed over the threaded portion of the work. The rough turning operation and the subsequent final turning of the $\frac{5}{8}$ in. dia. portion to size may be carried out with an angular parting tool mounted in the back toolpost. This tool should have a slight facet at the top, as shown in Fig. 6. in order to impart a good finish to the work. When the rough turning has been completed, an external threading tool is mounted in the top-slide toolpost, which is set over to $27\frac{1}{2}$ deg., that is, one-half of the included angle of a Whitworth Standard V-thread. The necessary change wheels to cut 1-in. B.S.F. or 10 threads-per-inch, are then set up, and the lathe is turned by hand to see that all is in order. The top-slide index is then set to zero and the tool is fed in, by means of the cross-slide feed handle, until the tip of the tool is felt to just touch the work. The cross-slide index is now set to zero, to ensure that the tool is correctly reset after withdrawal from the work at the end of the cut. If a preliminary cut, 0.002 in. deep, is taken over the work, this will indicate whether the tool has been correctly set. Following this, cuts 0.005 in. in depth are practicable and, indeed, sufficient, for the steel supplied is somewhat tough. A soap-and-water lubricant will be found to give a good finish.

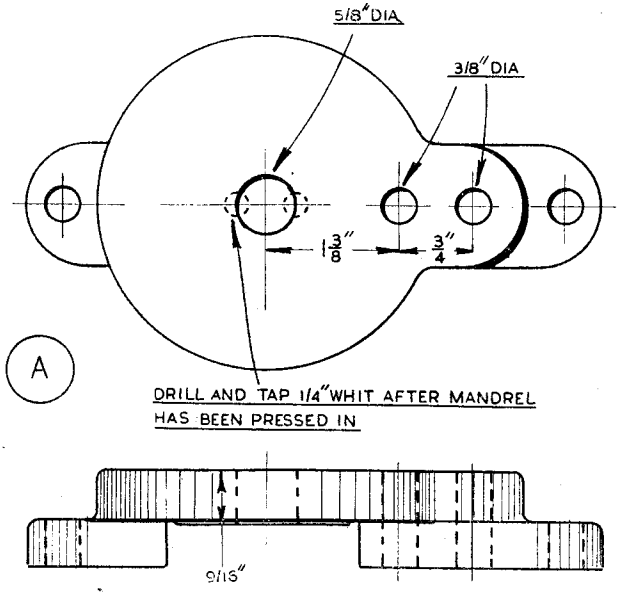
When the top-slide is set over $27\frac{1}{2}$ deg., a movement of 0.001 on the index will give an actual tool feed of some 0.0008 in. This point must be borne in mind. One-inch B.S.F. thread has a depth of 0.064 in. and the tool must therefore be fed inwards by this amount.

Full information and instructions in connection with the details of screw-cutting are given in "Screw Threading and Screw Cutting," published by Percival Marshall & Co., and reference should be made to this or some similar book for further guidance on the matter.

After the threading has been completed, the $1\frac{5}{8}$-in. × $\frac{5}{8}$-in. dia. spigot is finish-turned, and the component is then parted-off in Operation 3.

Machining the Top-Plate "E"

Operation 1. The dimensions of this part are given in Fig. 7. The casting is gripped in the 4-jaw chuck and the boss is set to run truly. The face of the boss and the top surface of the plate are then machined with a right-hand knife tool. A round-nose tool is then mounted, in place of the knife tool, and is used for turning the side of the boss and for forming the fillet at its base. The slight radius at the top of the boss is best made by turning with a hand graver.



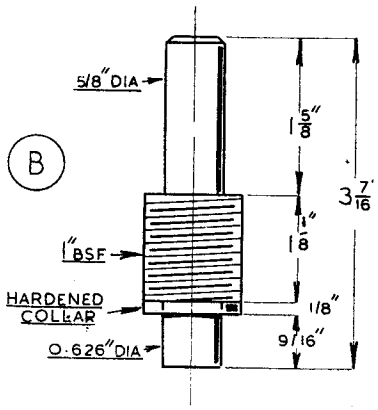


Fig. 5. Details of screwed mandrel "B"

Left—Fig. 4. Details of base

Operation 2. The casting is now removed from the 4-jaw chuck and is gripped in the self-centring chuck, where it is held by the boss, and is then centre-drilled to allow the tailstock to support the work while the rim of the plate is turned to a clean finish. This may leave the finished diameter of the component slightly less than the 3½ in. given in the drawings, but this is not of material

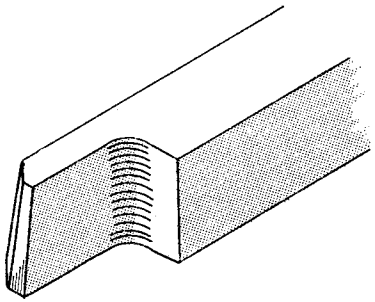


Fig. 6. Tool for machining spigot on mandrel

importance. Whilst the work is still in the self-centring chuck, a slight chamfer should be formed on the top edge of the rim by means of the chamfering tool set in the back toolpost.

Operation 3. The work is now removed to the 4-jaw chuck, and is gripped by the turned rim with the boss towards the face of the chuck. The work is then set to run truly by applying a dial indicator to the rim. A right-hand knife tool is now mounted in the top-slide and the face is machined till the thickness of the plate is reduced to the ⅜ in. dimension called for in the drawing. The plate is now centre-drilled, drilled and bored ready for threading 1-in. B.S.F. The theoretical core size of a 1-in. B.S.F. thread is

1.000 in. × 2(0.064 in.) = 0.875 in.,

but it is advisable to leave the bore some 0.010 in. larger than this.

Operation 4. As has previously been remarked, the details of threading operations are dealt with fully in a book on the subject, so no further description of this part of the work need be given here, but it must be emphasised that the threads should be well cut, and a good fit, so that the two mating parts go together without shake. Before being threaded, however, the bore must be opened out to 1 in. dia. for a distance of ¼ in., as shown in the drawing, to allow the plate to pass over the hardened collar which fits on the ⅝-in. dia. spigot of the mandrel.

When the threading has been finished machine work on the plate is complete.

Making the Bending Head "D"

Operation 1. A piece of rectangular bright mild-steel is supplied for making this component to the drawing, Fig. 8, and the first step is to prepare the material for machining by filing all surfaces to remove burrs.

Operation 2. The material is now gripped in the 4-jaw chuck, and one end is faced with a right-hand knife tool.

Operation 3. After the work has been removed from the 4-jaw chuck it is measured and any great excess of material is removed with a hacksaw before the work is again replaced in the chuck for facing accurately to a length of 2⅝ in.

Operation 4. The work is now marked off, according to the dimensions given in the drawing, so that both the ⅝-in. hole to receive the mandrel and the ⅜-in. hole for the plunger may be machined from the underside of the component.

Operation 5. The material is now centre-drilled in the drilling machine so that a "Wobbler" may be applied to the centres of both holes. Next, the part is gripped in the 4-jaw chuck and the ⅜-in. hole is centred by means of a dial test indicator which is applied to the "wobbler." This method of centring work has been described fully in the past and also appears in Vol. I of "In the Workshop," so that further description is not necessary here.

After the work has been centred it is pilot-drilled, drilled and finally reamed ⅜ in. It is preferable to carry out the drilling in stages, finishing with a letter U drill, or a 9.4 mm. drill if this size is available. The reaming can be performed in the lathe, for it will be of little account if, as is most likely, the hole is formed slightly oversize. Matters are somewhat different, however, when forming the ⅝-in. dia. hole in *Operation* 6. This hole must be bored, for it is not possible to ream it, and the bore should be made a close working fit on the mandrel. The methods employed for forming the hole are similar to those used in the previous operation, except that reaming is omitted.

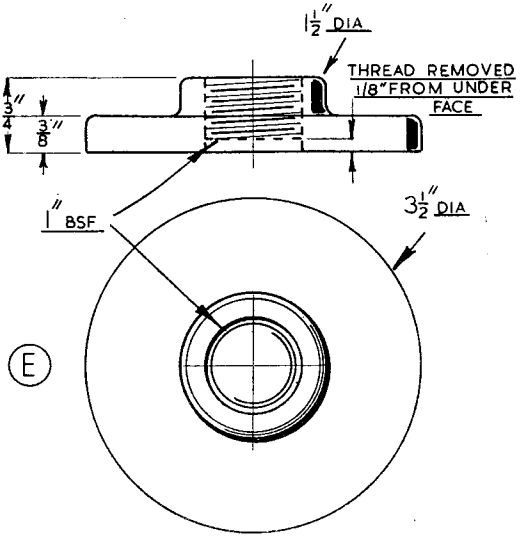


Fig. 7. Details of top-plate

Operation 7. The centres of the two ⅜-in. dia. holes for the handle *F* are next marked off on one end of the bending head and both are centre-drilled in the drilling machine.

Operation 8. The work is now gripped in the 4-jaw chuck, and one hole is centred, drilled and reamed ⅜ in. *clear through* for reasons which will presently be apparent.

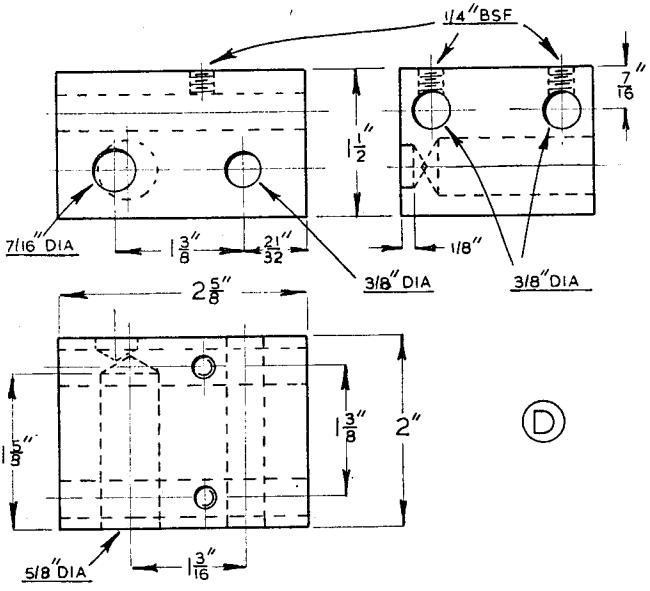


Fig. 8. Details of the bending-head

Operation 9. The component is now removed from the chuck and the centre of the other ⅜ in. dia. hole is drilled and tapped 5-B.A. so that a toolmaker's button may be used for accurately spacing the holes.

The use of the toolmaker's button has been described many times in the past, but it will not be out of place to restate briefly the method.

The toolmaker's button consists of a true hollow cylinder of steel, having its ends ground or turned dead square with the axis. A screw passes through the button, which has a bore greatly in excess of the diameter of the screw. This screw, as seen in Fig. 9, is fitted with a washer and serves to clamp the button to the work. In order to facilitate calculation, the diameter of the buttons are made an exact decimal figure and are either .3, .4, .5 or 1 in. in diameter.

Buttons may be used for accurately positioning a hole from the edge of a piece of work, or they may be employed to locate centres for spacing holes at a precise distance from one another.

In use, toolmakers' buttons are set accurately by means of a micrometer, vernier slide gauge, or slip gauges. They are then firmly clamped to the work by the screws passing through their centres. The part to which the buttons are attached is then mounted in the lathe, either in the 4-jaw chuck or on the faceplate, and one button is then set to run truly by means of a dial test indicator. When this has been done, the button is removed from the work, and the tapped hole is opened out with a boring tool to the required size. Any other buttons which may be attached to the work are treated in the same way.

When setting out the centres for the two ⅜-in. dia. holes, the 1⅜ in. dimension shown on the drawing must be ignored, for this is a nominal measurement only, and is most unlikely to correspond with the actual distance to which the makers have made the arms of the lever *G*. The distance measured over the outside of these arms, must therefore, be found. This is done by gripping the part in the vice and compressing it until micrometer readings, taken at each end of the lever over the outside of the arms, are identical.

Let it be supposed that this measurement is found to be 1.762 in. The setting of the button will be facilitated if a button ⅜ in. dia. is specially made corresponding with the diameter of the arm. If a closely fitting plug is now inserted in the ⅜-in. hole previously machined in the bending head, this

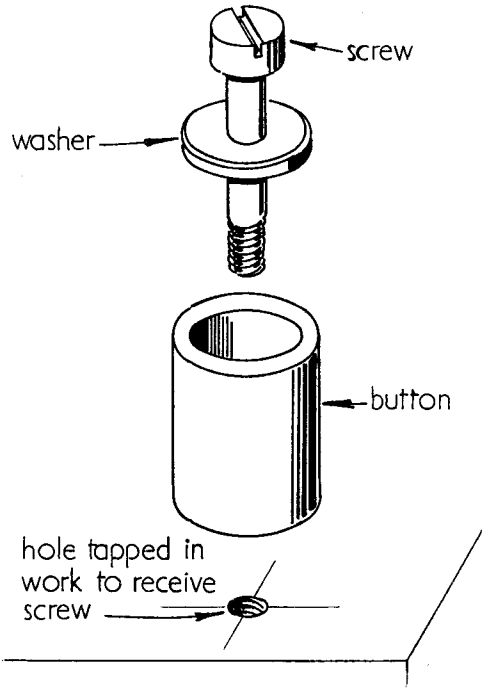


Fig. 9. The parts of a toolmaker's button

plug can be used for setting the button to the outside dimension of 1.762 in. with the aid of a micrometer or vernier caliper. Should, however, a standard button be used, the difference of diameter must, of course, be taken into account in determining its position.

The work is now mounted in the 4-jaw chuck and the button is set to run truly by means of a

test indicator. The button is then removed and the tapped hole is cleared with a small boring tool so that the work may be drilled and reamed $\frac{3}{8}$ in.

The drawing, Fig. 8, shows these $\frac{3}{8}$-in. holes to be blind-ended, but in the modification these holes have been machined clear through, so that, firstly, the lever can be withdrawn into the machine to enable it to take up a small space when packed away, and secondly, what is more important, the bending head can then be used as a jig for drilling and reaming the sliding stud *H*.

Operation 10. The work is now removed from the chuck and the centres for the two $\frac{1}{4}$-in. grub-screws which secure the lever are marked off, then drilled and tapped. In the drawing, these holes are shown as tapped $\frac{1}{4}$-in. Whitworth; but it is preferable to make them $\frac{1}{4}$-in. B.S.F., so that Allen screws may be used instead of the screwdriver slotted grub screws supplied in the kit.

Operation 11. The final operation consists in marking off and drilling the $\frac{7}{16}$-in. dia. hole in the top of the bending head to accommodate the tail of the plunger when not in use. This hole, as will be seen, is drilled at $1\frac{3}{8}$ in. centres from the previously drilled and reamed $\frac{3}{8}$-in. hole.

(To be continued)

CLUB ANNOUNCEMENTS

Guildford and District Model Yacht, Power Boat and Engineering Society

Forthcoming events will include the following: July 29th, Track event and model exhibition at Bradstone Brook, Shalford, 2.30 p.m.; 30th, Power boat regatta at Stoke Park pond, 11 a.m.; August 1st, Monthly meeting at Astra House, 7.30 p.m.; 7th, Running trials for $3\frac{1}{2}$-in. gauge, Stoke Park Mansion, 2 p.m.; 19th, Track event, Bellfields Playing Fields, 2 p.m.; September 5th, Monthly meeting at Astra House, 7.30 p.m., and 23rd, annual club exhibition at Ward Street Hall.

Hon. Secretary: W. E. ROBERTS, Cannock, 52, Saffron Platt, Guildford, Surrey.

West London Society of Model Engineers

Due to the summer recess and reorganisation, the workshop will be closed until September 25th. A special meeting will, however, be held at Middle Row School, Kensal Road, W.10, on September 13th, 1950, to decide the policy and activities of the society during the winter session.

Hon. Secretary: E. J. OAKERVEE, 92, Harvist Road, Kensal Rise, N.W.6.

Aylesbury and District Society of Model Engineers

The service van belonging to the British Oxygen Company arrived outside Hampdon Buildings, Aylesbury, recently for a demonstration to the society.

Mr. Warner, the B.O.C. representative, gave a most interesting talk on this very essential part of model making. Although Mr. Warner dealt only with brass and copper, the information he imparted on these two metals was of great benefit to all members present.

After his demonstration, several members were converted to the idea that acetylene welding was definitely the thing for the model engineer, although quite a few snags with the acetylene are met with by amateurs.

Hon. Secretary: N. F. SOUTHERTON, Astracot, Bucklands Wharf, Aston Clinton, Bucks.

The East Sussex Locomotive Club

During Hastings Carnival Week we operated our track at the White Rock Gardens and in spite of poor weather had quite a successful week. Members P. Uridge, F. De-Mayo and L. J. Markwick used up their holiday in a good cause, ably assisted by the rest of the "gang" at various times.

A recent evening was spent enjoying the hospitality of Mr. C. M. Keiller and inspecting his superb locomotive stud. After seeing the work of this miniature locomotive craftsman, members are all resolved to do better than ever. We wish to thank Mr. Keiller for his most cordial invitation and a very enjoyable evening.

For August we are fully booked for every Wednesday and Saturday. We are always pleased to meet at these fetes, any model engineers who may be on holiday "Down South." Two more locomotives will shortly be completed. First Mr. F. De-Mayo's 0-6-0 tank and second Mr. Markwick's L.M.S. Class 5.

Hon. Secretary: L. J. MARKWICK, 577, Bexhill Road, St. Leonards-on-Sea.

Eltham and District Locomotive Society

The next meeting will take place at the Beehive Hotel, Eltham, on Thursday, August 3rd, at 7.30 p.m., when it is hoped to continue the workshop discussion arranged by Mr. Weedon. On June 24th the society held their first open day at the permanent track at Eltham. Some very good running was obtained and the trolleys recently constructed by Messrs. Weedon, Dunlop and Crampton were very effective and smooth. Very great thanks are due to Mr. Dunlop, the designer of the permanent track, for the great amount of work and skill he has put into the track which has been found to be very smooth running and remaining perfect under all weather conditions. The traverser for the steaming bays has now been completed by Mr. Hutton, and found to be a very useful addition to the track. The following track runs are booked as under:—

July 29th. Ministry of Supply, Chislehurst.
August 19th. Woolwich Arsenal Sports Club.
Visitors are always welcome at the meetings.

Hon. Secretary: F. H. BRADFORD, 19, South Park Crescent, Catford, S.E.6.

K.S.E.E.C.

To talk to a mixed group of beginners and more advanced workers on a highly technical subject and to hold their interest is an achievement. Mr. W. I. Flack (M.I.R.E.) of the Telegraph Condenser Co. Ltd. did so recently, when he gave a lecture-demonstration of the View Master television receiver to a joint group of the Harrow and Wembley Model Engineering Society and the K.S.E.E.C. Mr. Flack used slides, blackboard sketches and an actual View Master set to illustrate his points, and with his obviously complete mastery of this branch of electronics gave a very clear exposition of the principles and practice of television reception.

Question time was well employed and both societies expressed their appreciation to Mr. Flack for a very interesting evening.

Hon. Secretary: E. G. TOTMAN, Kodak Hall, Wealdstone.

Scunthorpe Society of Model Engineers

The quarterly meeting of the society was held on Wednesday, July 5th, in the workshop. During the period under review the main activity has been in the making of improvements to the society's miniature railway, two ball-bearing bogies having been built for passenger-carrying. These are most successful in operation and at both the Appleby-Frodingham, and Lysaghts works children's galas many more passengers were carried than on previous occasions.

Hon. Secretary, L. WALPOLE, 42, Alexandra Road, Ashby, Scunthorpe, Lincs.